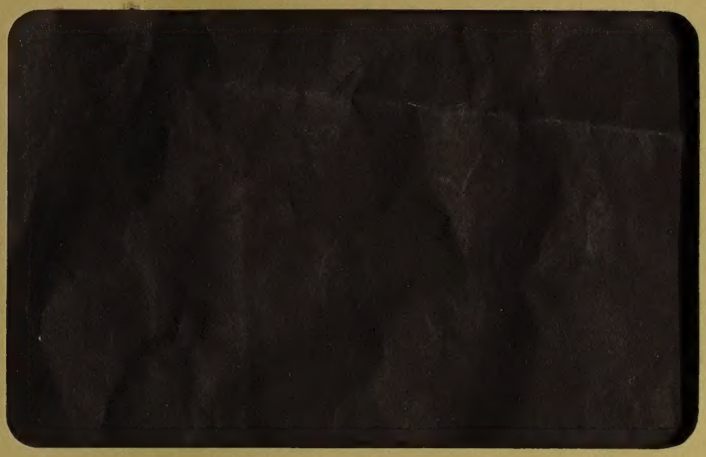
# MEGURO



Electronic Services - Los Angeles
M140701X

MEGURO ELECTRONICS CORPORATION

ELECTRONIC SERVICE
1200 KONA DRIVE
COMPTON, CA 90220
(213) 605-1260

# MN-446

## NOISE METER

MEGURO ELECTRONICS CORPORATION
1-5, 2-CHOME CHUO-CHO
MEGURO-KU TOKYO JAPAN

ELECTRONIC SERVICE
1200 KONA DRIVE
COMPTON, CA 90220
(213) 605-1280

## PRECAUTIONS FOR USE

- The ambient temperature during operation should be between 0 and 40°C. Avoid using the MN-446 at temperatures below 0°C or on top of equipment generating a lot of heat. (Note that performance is only guaranteed in the range 5 to 35°C.)
- It is very important to make sure that the voltage setting of the supply voltage selector on the rear panel agrees with the ac line voltage.
- Check that the meter is mechanically zeroed before turning the power on. If it is not, this will produce measurement errors, so make sure to adjust the meter to zero using the adjustment screws.
- Make sure that voltage in excess of the maximum allowable input voltage (peak value 450 V including the dc component) is not applied to the INPUT connector.
- Rubbing the meter cover roughly to wipe away dirt will charge it, causing indication errors.
- Allow three minutes warm-up time after the power is turned on.

## PRECAUTIONS FOR USE

- The ambient temperature during operation should be between 0 and 40°C. Avoid using the MN-448 at temperatures below 0°C or on top of equipment generating a lot of heat. (Note that performance is only guaranteed in the range 5 to 35°C.)
- It is very important to make sure that the voltage setting of the supply voltage selector on the rear panel agrees with the ac line voltage.
- Check that the meter is mechanically zeroed before turning the power on. If it is not, this will produce measurement errors, so make sure to adjust the meter to zero using the adjustment screws.
- Make sure that voltage in excess of the maximum allowable input voltage (peak value 450 V including the dc component) is not applied to the INPUT connector.
- Rubbing the meter cover roughly to wipe away dirt will charge it, causing indication errors.
- Allow three minutes warm-up time after the power is turned on.

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# 1. GENERAL

## 1.1 Introduction

The high-sensitivity MN-446 electronic voltmeter measures ac voltage and can be operated under remote control.

The frequency range of the MN-446 is 10 Hz to 500 kHz. DIN- and CCIR-standard quasi-peak value, the usual average value, as well as rms value readings can be selected. Five types of DIN-, JIS- and CCIR- standard filters are included for noise-voltage and signal-to-noise (S/N) ratio measurement. These features combined with the 10-μV full-scale range make the MN-446 ideal for measurement of noise levels in all types of recording and audio equipment.

An added feature for S/N measurement is the built-in gain controller which enables relative measurement of levels.

## 1.2 Features

- The following five types of audio-compensation filters are built-in.

  a. DIN 45405 (1967) standard for external-voltage measurement [DIN/AUDIO]

  b. DIN 45405 (1967) standard for noise-voltage measurement [DIN/NOISE]

  c. JIS C1502A
     JIS C5551A
     IHF-A-202
     IEC 179-A
     NAB
     Standards for noise-voltage measurement [IEC]

  d. CCIR (468-1)
     CCIR (468-2)
     DIN 45405 (1978)
     Standards for noise-voltage measurement [CCIR]

  e. CCIR/ARM
     IHF-A-202
     Standards for noise-voltage measurement [CCIR/ARM]

- Measurements can be read in any of the following three types of indication system.

  a. DIN 45405 (1967)
     DIN 45405 (1978)
     CCIR (468-1)
     CCIR (468-2)
     Standards for quasi-peak value detection for and indication for sine waves [QUASI-PEAK]

  b. Average-value detection for sine-wave rms indication [AVER]

  c. Rms-value detection for sine-wave rms indication [R.M.S.]

  Note that the average-value detection circuit is selected automatically for noise-voltage measurement using the CCIR/ARM filter.

- A gain controller that can be varied continuously in the range 0 to approximately −10 dB is built-in.
- Ac output and dc output terminals are provided.
- The built-in CCIR/ARM audio-compensation filter enables noise measurement of consumer audio equipment with Dolby noise reduction systems.
- Control signals can be used to operate the MN-446 under remote control.

## 1.3 Accessories

| Description | Code | Quantity | Remarks |
|---|---|---|---|
| Input cable | | 1 | Alligator clip/BNC plug |
| AC power cord | | 1 | |
| Fuse | | 2 | 0.5 A or 0.3 A, slow blow |
| Instruction manual | MN-446 | 1 | |

## 2. SPECIFICATIONS

| | |
|---|---|
| Measurement frequency range | 10 Hz to 500 kHz when audio-compensation filters are not used |
| Measurement voltage range | 10 μV to 300 V (full scale), 16 ranges in 10-30 sequence<br>−100 to +50 dB (full scale)<br>0 dB = 1 Vrms<br>−98 to +52 dBm (full scale)<br>0 dB = 0.775 Vrms |
| Indicator accuracy | a. AVER<br>All ranges: Max. reading ±3%<br>(excluding 10-μV range)<br>b. QUASI-PEAK and R.M.S.<br>All ranges: Max. reading ±5%<br>(excluding 10- and 30-V ranges)<br>Excluding cases when values exceed 100 V or 42 dBm, or when audio-compensation filters are used. |
| Frequency characteristics | a. AVER<br>10-μV range<br>20 Hz to 20 kHz ±5%<br>10 Hz to 30 kHz ±7%<br>10 Hz to 50 kHz ±15%<br>30- and 100-μV ranges<br>20 Hz to 100 kHz ±5%<br>10 Hz to 200 kHz ±7%<br>10 Hz to 300 kHz ±15%<br>300-μV and higher ranges<br>20 Hz to 200 kHz ±5%<br>10 Hz to 500 kHz ±7% |

b. QUASI-PEAK and R.M.S.
10-μV range
20 Hz to 20 kHz ±10%
10 Hz to 30 kHz ±15%

30-μV and higher ranges
10 Hz to 50 kHz ±10%

Indicator system and scale

a. DIN 45405 (1967)
DIN 45405 (1978)
CCIR (468-1)
CCIR (468-2)
Standards for quasi-peak detection (see Sections 4.4 and 4.5) of sine waves for an rms indication [QUASI-PEAK]

b. Average detection of sine waves for an rms indication [AVER.]

c. True rms (crest factor < 2) detection of sine waves for an rms indication [R.M.S.]

Note
When noise voltage is measured with the CCIR/ARM audio-compensation filter, the average (AVER) detection system is selected independent of the setting of the RESPONSE switch.

Audio-compensation filters

a. DIN 45405 (1967) Standard audio signal (10 Hz to 20 kHz) measurement filter [DIN/AUDIO]

b. DIN 45405 (1967) Standard noise-voltage measurement filter [DIN/NOISE]

c. JIS C1502A
JIS C5551A
IHF-A-202
IEC 179-A
NAB
Standard noise-voltage measurement filters [IEC]

| | |
|---|---|
| | d. CCIR (468-1)<br>CCIR (468-2)<br>DIN 45405 (1978)<br>Standard noise-voltage measurement filters (referenced to 0 dB at 1 kHz)<br>[CCIR] |
| | e. CCIR/ARM (Dolby system) standard noise-voltage measurement filters (referenced to 0 dB at 2 kHz)<br>[CCIR/ARM] |
| Sensitivity adjustment range | 0 to −10 dB min. |
| Input impedance | 1 MΩ, unbalanced, approx. 30 pF parallel capacitance |
| Max. allowable input voltage | 10-μV to 30-mV range<br>AC: 10 Vrms, DC: 450 V<br>Above 100 mV range<br>AC: 330 Vrms, DC + AC peak: 450 V |
| Output voltage | Open-circuit voltage at meter full scale<br>AC: 1 Vrms ±10%<br>DC: 1 V ±10% |
| Output impedance | AC: Approx. 600 Ω, unbalanced<br>DC: Approx. 1 kΩ, unbalanced |
| Residual noise | a. AVER and R.M.S.<br>Max. 1.5 μV in 10-μV range<br>Max. 3.0 μV in 30-μV range |
| | b. QUASI-PEAK<br>Max. 2.0 μV in 10-μV range<br>Max. 4.0 μV in 30-μV range |
| Remote control | Parallel system, positive logic, TTL level with photo-isolator<br>RESPONSE (common to both channels): 2 bits<br>WEIGHTING (common to both channels): 3 bits<br>RANGE switch (separate channels): 4 bits<br>57-30240 24-pin connector |

| | |
|---|---|
| Operating temperature range | 0 to 40°C (range of guaranteed performance: 5 to 35°C) |
| Stability with respect to line-voltage variation | All functions are stable within ±10% of ac rating voltage |
| Power supply | 100 VAC, 115 VAC, 215 VAC, 230 VAC ±10%, 50/60 Hz, approx. 40 VA |
| Max. dimensions | 150(W) × 225(H) × 310(D) mm |
| Weight | Approx. 5 kg |

## 3. PANEL DESCRIPTIONS

### 3.1 Front Panel Description

Front Panel Layout

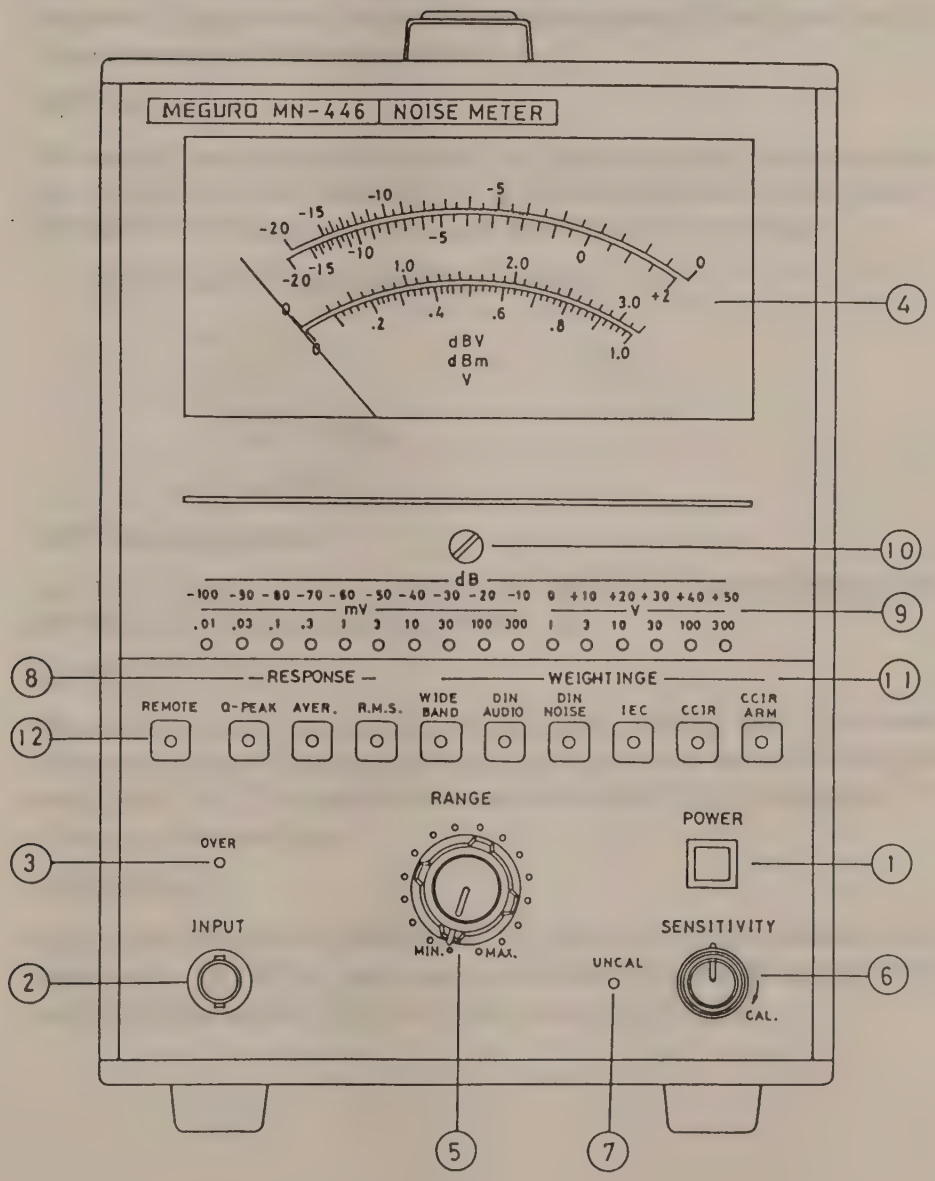



Fig. 3-1

① POWER switch

② INPUT BNC connector

The MN-446 input connector. The input impedance is 1 MΩ.

③ OVERDRIVEN LEDs

This monitor lamp is used to prevent incorrect measurement due to excessive input when the audio-compensation filters are used or when measuring pulse-type noise.

④ METER

The meter indicates the level of the signals under measurement. The meter scale is determined by the settings of RANGE switch ⑤, SENSITIVITY adjustment ⑥, and WEIGHTING switches (11).

It has the following set of four scales.

0 to 3 V

0 to 1 V

−20 to + 2 dBm

−20 to 0 dBV

⑤ RANGE rotary switch

Any of 16 levels can be selected for METER ④ sensitivity when SENSITIVITY adjustment ⑥ is set to CAL.

⑥ SENSITIVITY knob

The meter sensitivity can be continuously varied with this knob. Absolute values of the signal being measured can be read when the setting is CAL. The meter scale can be varied by approximately 10 dB at any other setting.

⑦ UNCAL LED

This lights when the SENSITIVITY knob is at any setting other than CAL. At UNCAL setting, a warning tone will be generated if the BUZZER switch (21) (on the rear panel) is set to ON.

⑧ RESPONSE pushbutton switches

The following three types of level-indication systems can be selected.

a. Q-PEAK

DIN 45405 (1967, 1978) and CCIR (468-1, 4A68-2) standard quasi-peak value readings.

b. AVER

The usual average value readings.

c. R.M.S.

Rms readings for sine waves up to a crest factor of 2.

⑨ RANGE LEDs

These lamps indicate the measurement ranges from −100 dB (0.01 mV) to +50 dB (300 V) selected with RANGE rotary switch ⑤.

⑩ This screw is used to mechanically zero the meter.

⑪ WEIGHTING pushbutton switches

The following MN-446 measurement functions can be selected with these switches.

a. WIDE BAND

Selected when the MN-446 is used as a regular level meter.

b. DIN/AUDIO

Selected when DIN 45405 (1967) standard audio (10 Hz to 20 kHz) level measurement is to be performed.

In this case, the Q-PEAK RESPONSE switch must be selected.

c. DIN/AUDIO

Selected when DIN 45405 (1967) standard noise-level measurement is to be performed.

In this case, the Q-PEAK RESPONSE switch must be selected.

d. JIS A

Selected when JIS C1502A, JIS C5551A, IHF-A-202, IEC179-A, or NAB standard noise-level measurement is to be performed.

e. CCIR

Selected when CCIR (468-1, 468-2), DIN 45405 (1978) standard noise-level measurement is to be performed.

In this case, the meter indication system is set to AVER no matter what RESPONSE switch selection is made.

⑫ REMOTE switch

This is used to enable remote control of the MN-446 from control signals via the connector on the rear panel.

These remote control signals can be used to make all settings for RANGE rotary switch ⑤, RESPONSE switch ⑧, and WEIGHTING switch ⑪.

## 3.2 Rear Panel Description

Rear Panel Layout

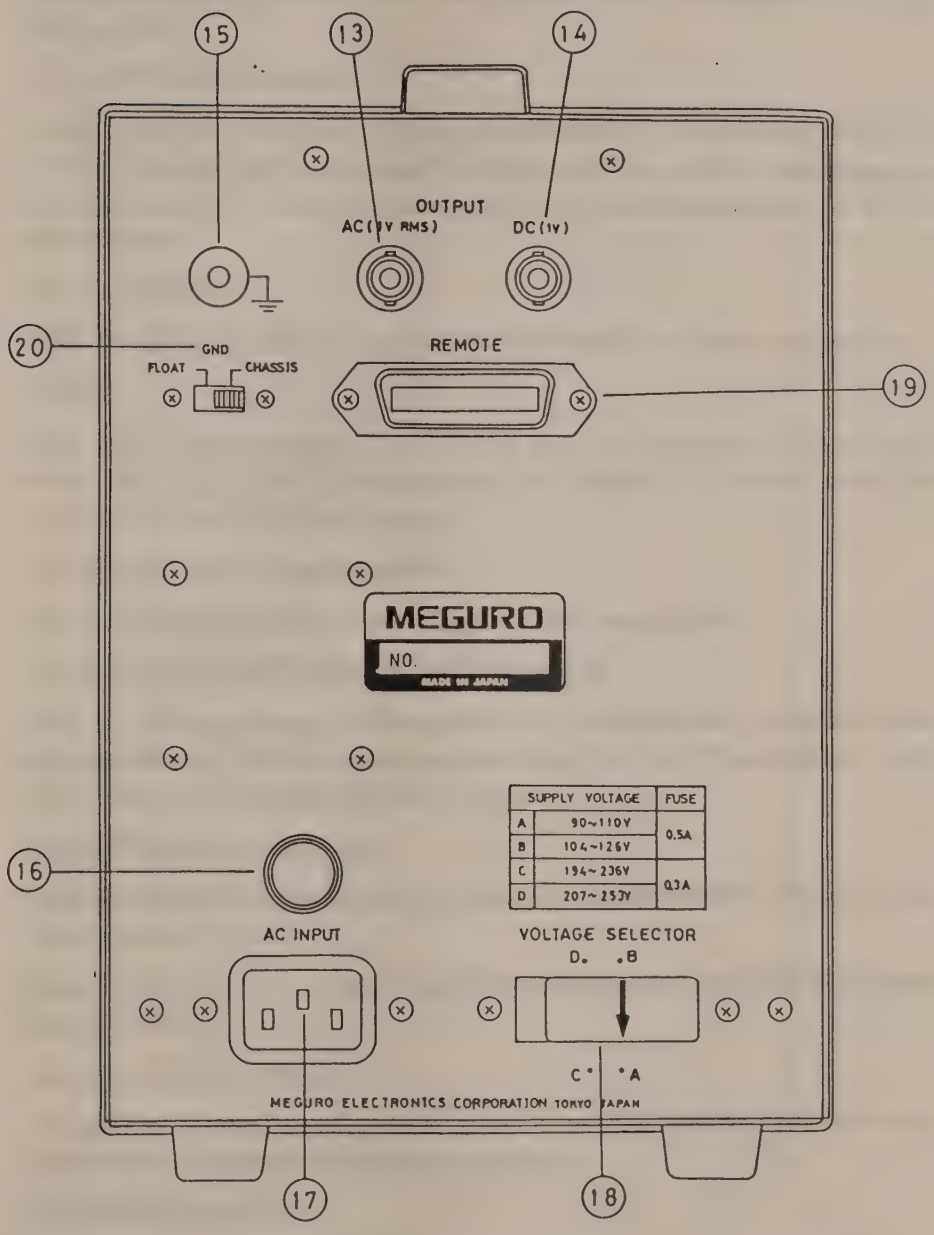



Fig. 3-2

⑬ AC OUT BNC connector

This is the MN-446 monitor output connector. A maximum output of 1 Vrms AC (meter full scale) can be obtained, the output impedance is approximately 600 Ω, and the optimal load impedance is 47 kΩ minimum.

⑭ DC OUT BNC connector

This is the MN-446 monitor output connector. A maximum output of 1 VDC (meter full scale) can be obtained, the output impedance is approximately 1 kΩ, and the optimal load impedance is 47 kΩ minimum.

⑮ Ground terminal

This terminal is used to connect the MN-446 to an external ground.

⑯ FUSE

This is the power-supply fuse. When the line voltage is in the range 90 to 126 VAC, a 0.5-A fuse is used, and when it is in the range 194 to 253 VAC, a 0.3-A fuse is used.

⑰ AC INPUT cable plug receptacle

This is the specified ac power-supply cable receptacle.

⑱ VOLTAGE SELECTOR line-voltage switch

This is the power-supply transformer primary-side terminal line-voltage switch. Set the plug arrow to A, B, C or D according to the table above the voltage selector switch.

⑲ REMOTE 24-pin connector

This 24-pin connector is used to connect the MN-446 to the optional remote control box.

Refer to Section 7 for more details on operation of the MN-446 under remote control.

⑳ Circuit GND slide switch

This switch is used to establish whether or not the MN-446 circuitry is to be floated with respect to the chassis.

㉑ BUZZER slide switch

For setting to ON and OFF the warning tone that sounds when SENSITIVITY knob ⑥ is set to UNCAL.

## 4. OPERATION

### 4.1 Preparations For Measurement

(1) Turn POWER switch ① off and connect the ac cord to the ac power supply.

(2) Connect the input cable to INPUT connector ②.

(3) Set the RANGE switch ⑤ to MAX and the SENSITIVITY knob ⑥ to CAL.

(4) Once all the above settings have been made, turn the POWER switch ① on and the MN-446 will begin to operate, so connect the input cable to the measurement point.

### 4.2 Noise Measurement

After the procedure for preparations for measurement (Section 4.1) is completed, measurement is performed in the following way.

(1) Make the settings for the RESPONSE switch ⑧ and WEIGHTING switch ⑪ shown in Table 4-1.

Table 4-1

| ⑪ WEIGHTING Switch (Standards in parentheses) \ ⑧ RESPONSE Switch | | Q-PEAK | AVER. | RMS |
|---|---|---|---|---|
| DIN/NOISE ( DIN 45405 1967 ) | | √ | | |
| IEC | JIS C1502A<br>JIS C5551A | | √ (Note) | |
| | ( IEC-179-A ) | | | √ |
| | ( NAB ) | | | √ |
| | ( DIN 45633) | | | √ |
| | ( IHF-A-202 ) | | √ | |
| CCIR ( 468-1,468-2 )<br>DIN ( DIN 45405 1978 ) | | √ | | |
| CCIR/ARM | | | √ | |

Thus, the settings for measurement for the different standards are as follows.

a. Noise measurement with DIN/NOISE (DIN 45405 – 1967) standards

| | |
|---|---|
| WEIGHTING | DIN/NOISE |
| RESPONSE | Q-PEAK |

b. Noise measurement with JIS A (JIS C1502A, C5551A) standards

| | |
|---|---|
| WEIGHTING | IEC |
| RESPONSE | R.M.S. or AVER. |

Note

The rms-value indication system is normally used for JIS A standard measurements, and at present average detection for rms-value indication of true sine waves is widely used. Thus, if accurate (true) rms detection is used for rms-value indication of sine waves in noise measurement, note that this will result in differences between previously measured values and the values measured in this way.

c. Noise measurement with IEC-A (IEC-179-A), NAB, and DIN (DIN 45633) standards

| | |
|---|---|
| WEIGHTING | IEC |
| RESPONSE | R.M.S. |

d. Noise measurement with IHF-A (IHF-A 202) standards

| | |
|---|---|
| WEIGHTING | IEC |
| RESPONSE | AVER. |

e. Noise measurement with CCIR (CCIR 468-1, 468-2) and DIN (DIN45405, 1978) standards

| | |
|---|---|
| WEIGHTING | CCIR |
| RESPONSE | Q-PEAK |

f. Noise measurement with CCIR/ARM standards

| | |
|---|---|
| WEIGHTING | CCIR/ARM |

Note

When WEIGHTING switch ⑪ is set to CCIR/ARM, RESPONSE is automatically set to AVER. no matter which switch is pressed.

(2) Set the noise level by going through the settings 300 V + 50 dB, 100 V + 40 dB, 30 V + 30 dB, etc., of RANGE switch ⑤, steadily increasing the sensitivity to make the meter deflection easy to read.

## 4.3 S/N Ratio Measurement

After the procedure for preparations for measurement (Section 4.1) is completed, S/N ratio measurement is performed in the following way.

Signal (S) Measurement

(1) Make the settings for the RESPONSE switch ⑧ and WEIGHTING switch ⑪ shown in Table 4-2.

Notes

1. Rms-value indication system is normally used for JIS A (JIS C1502A, C5551A) standard measurement, and at present average detection for rms-value indication (AVER.) is widely used for the indication system. Thus, if accurate rms detection is used for rms-value indication of true sine waves (R.M.S.), this will result in differences between previous measured values and the values measured in this way.
2. When measuring with the CCIR (CCIR 468-1, 468-2), the signal frequency must be set to 1 kHz.

Table 4-2

| ⑧ RESPONSE Switch / 11 WEIGHTING Switch (Standards in parentheses) | | Q-PEAK | AVER. | RMS |
|---|---|---|---|---|
| DIN/NOISE ( DIN 45405 1967 ) | | √ | | |
| DIN/AUDIO | JIS C1502A JIS C5551A | | √ (Note 1) | √ |
| | ( IEC-179-A ) | | | √ |
| | ( NAB ) | | | √ |
| | ( DIN 45633 ) | | | √ |
| | ( IHF-A-202 ) | | √ | |
| | CCIR/ARM | | √ | |
| CCIR ( 468-1,468-2 ) DIN ( DIN 45405 1978 ) 1 kHz measurement frequency Note 2. | | √ | | |

a. DIN (DIN 45405 – 1967) measurement

| | |
|---|---|
| WEIGHTING | DIN/AUDIO |
| RESPONSE | Q-PEAK |

b. JIS A (JIS C1502A, C5551A) measurement

| | |
|---|---|
| WEIGHTING | DIN/AUDIO |
| RESPONSE | R.M.S. or AVER. |

c. IEC-A (IEC-179-A),NAB, and DIN (DIN 45633) measurement

| | |
|---|---|
| WEIGHTING | DIN/AUDIO |
| RESPONSE | R.M.S. |

d. IHF-A (IHF-A 202) measurement

| | |
|---|---|
| WEIGHTING | DIN/AUDIO |
| RESPONSE | AVER. |

e. CCIR (CCIR 468-1, 468-2) and DIN (DIN45405, 1978) measurement

| | |
|---|---|
| WEIGHTING | CCIR |
| RESPONSE | Q-PEAK |

f. CCIR/ARM measurement

| | |
|---|---|
| WEIGHTING | DIN/AUDIO |
| RESPONSE | AVER. |

(2) Set the noise level by going through the settings 300 V + 50 dB, 100 V + 40 dB, 30 V + 30 dB, etc., of RANGE switch ⑤, steadily increasing the sensitivity to make the meter deflection easy to read.

The absolute values of audio-compensated signal levels can be read in this condition, but the S/N ratio is measured as a relative value and requires the following steps (3) and (4).

(3) Increase the meter sensitivity by one range using RANGE switch ⑤ to pin the meter needle.

Example with the signal level measured at step (2) as 1.5 Vrms:

The RANGE switch setting at this point is 3 V + 10 dB, so change it to 1 V, 0 dB to point the meter needle.

(4) Adjust the meter sensitivity by turning SENSITIVITY knob ⑥ counterclockwise so that meter deflection reaches 0 dB on the dBV scale.

The above steps complete signal (S) level setting, so now noise (N) measurement can begin.

- Noise (N) Measurement

(5) Make the following WEIGHTING switch settings for the respective measurement standards according to Table 4-1.

Note

The settings for the RESPONSE switches are the same as for signal measurement, so there is not need to change them.

a. Measurement with DIN (DIN 45405 – 1967)

WEIGHTING DIN/AUDIO

b. Measurement with JIS A (JIS C1502A, C5551A)

WEIGHTING IEC

c. Measurement with IEC-A (IEC-179-A), NAB, and DIN (DIN 45633)

WEIGHTING IEC

d. Measurement with IHF-A (IHF-A 202)

WEIGHTING IEC

e. Measurement with CCIR (CCIR 468-1, 468-2)

WEIGHTING CCIR

f. Measurments with DIN (DIN 45405 – 1978)

WEIGHTING CCIR

g. Measurement with CCIR/ARM

WEIGHTING CCIR/ARM

(6) While making the settings in step (5), the meter indicates the noise level, so increase the sensitivity of the meter using RANGE switch ⑤ to make the meter needle deflection easy to read.

At this point, the S/N ratio is obtained by subtracting the noise (N) level (dB) measured in step (6) from the signal (S) level (dB) measured in step (4).

## 4.4 Reference Material 1

- DIN-Standard Quasi-Peak-Value Indication (taken from DIN 45405 1967)

  A measuring instrument that meets the requirements of the measurement test listed below must be used for measurement of noise and external voltage with peak-value indication.

  (1) The test is performed using a uniform ac pulse of fixed length, and the indicated value is in the range shown in Table 4-3.

  (The frequency of the ac signal riding on each pulse is 5 kHz.)

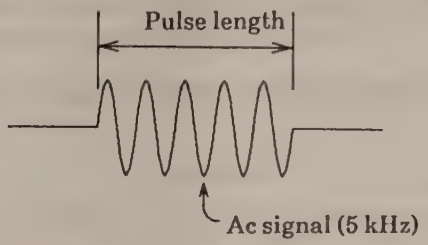
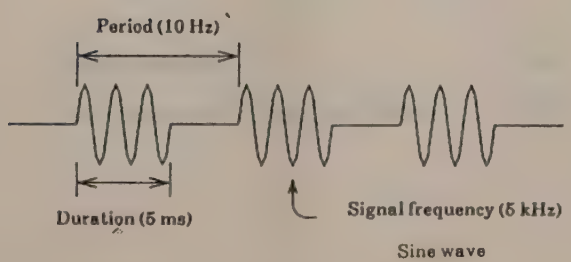



Table 4-3

| Pulse length ms | | 10 | 20 | 50 | 100 | 200 | ∞ |
|---|---|---|---|---|---|---|---|
| Indicator standard value % | | 48 | 52 | 59 | 68 | 80 | 100 |
| Allowable range % | Max. | 55 | 60 | 68 | 78 | 92 | – |
| | Min. | 41 | 44 | 50 | 58 | 68 | – |

(2) Test the measuring instrument with the following test signal and check that the indicator reaches 70 to 90% of full scale.

| | |
|---|---|
| Pulse length | 5 ms |
| Pulse period | 10 Hz |
| Frequency of signal in pulse | 5 kHz |



## 4.5 Reference Material 2

- CCIR-Standard Quasi-Peak-Value Indication (taken from CCIR 468-2)

Note

These standards apply also to DIN 45405 (1978).

(1) Single-Pulse Test

The test is performed using a fixed-length single-pulse generator, and the indicated value is in the range shown in Table 4-4.

These measurement conditions are valid for all measurement ranges and apply for an indication between meter full scale and 1/3 scale.

(The ac signal riding on each pulse is 5 kHz.)

Table 4-4

| Pulse length ms | | | 1 | 2 | 5 | 10 | 20 | 50 | 100 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|
| Indicator standard | | % | 17.0 | 26.6 | 40 | 48 | 52 | 59 | 68 | 80 |
| | | dB | −15.4 | −11.5 | −8.0 | −6.5 | −5.7 | −4.6 | −3.3 | −1.9 |
| Allowable range | Max | % | 21.4 | 31.6 | 46 | 55 | 60 | 68 | 78 | 92 |
| | | dB | −13.4 | −10.0 | −6.6 | −5.2 | −4.4 | −3.3 | −2.2 | −0.7 |
| | Min | % | 13.5 | 22.4 | 34 | 41 | 44 | 50 | 58 | 68 |
| | | dB | −17.4 | −13.0 | −9.3 | −7.7 | −7.1 | −6.0 | −4.7 | −3.3 |

(2) Repetitive Pulse Test

Using a fixed-length pulse tone-burst generator, check that the indication values are within the ranges in Table 4-5 below.

These measurement conditions are valid for all measurement ranges and apply for an indication between meter full scale and 1/3 scale.

| | |
|---|---|
| Pulse length | 5 ms |
| Frequency of signal on pulse | 5 kHz, sine wave |

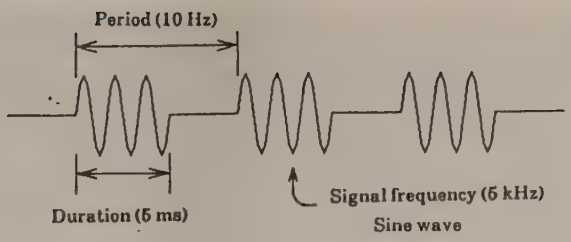
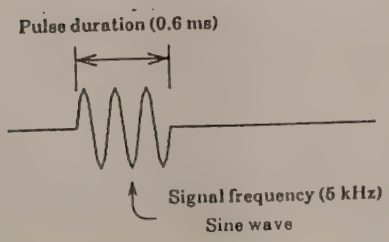



Table 4-5

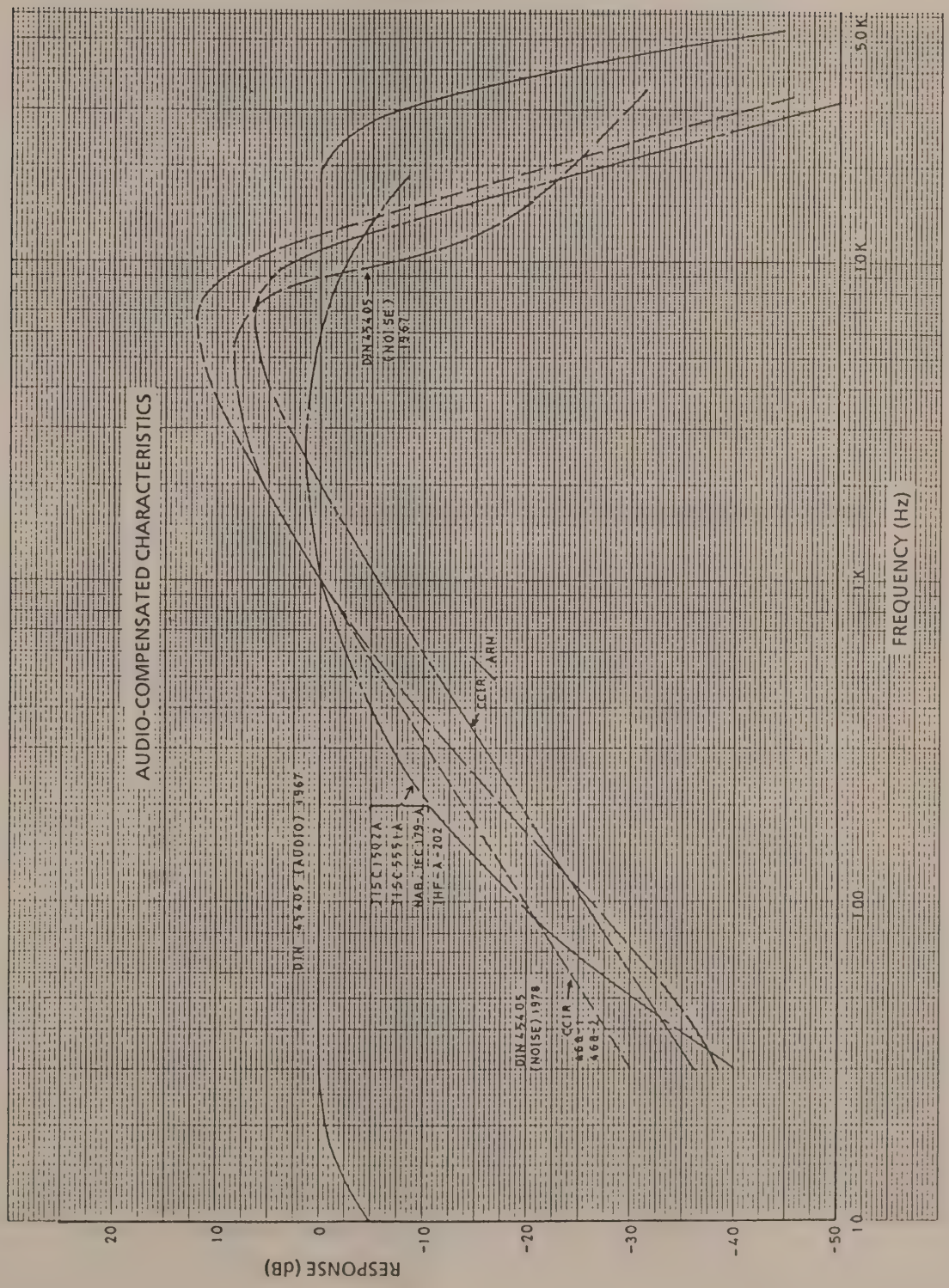
| Pulse repetition period (cycles) | | | 2 | 10 | 100 |
|---|---|---|---|---|---|
| Standard indication | | % | 48 | 77 | 97 |
| | | dB | −6.4 | −2.3 | −0.25 |
| Allowable range | Max. | % | 53 | 82 | 100 |
| | | dB | −5.5 | −1.7 | 0 |
| | Min. | % | 43 | 72 | 94 |
| | | dB | −7.3 | −2.9 | −0.5 |

(3) Excessive Input Test

The test is performed using single 0.6-ms ac pulse with a signal of frequency 5 kHz, indicated values vary in the range 0 to −20 dB and track the attenuation steps within ±1 dB deviation.



## 4.6 Reference Material 3



(1) DIN 45405 (1967) Standard Audio Measurement Filter Characteristics

Table 4-6

| Frequency | Response, dB | Tolerance, dB |
|---|---|---|
| 4Hz | ≧ -20 | |
| 10 | ≧ - 5 | |
| 31.5 | | |
| 1kHz | 0 | ±0.5 |
| 20 | | |
| 25 | ≧ - 3 | |
| 50 | ≧ -40 | |

(2) DIN 45405 (1967) Standard Noise Measurement Filter Characteristics

Table 4-7

| Frequency | Response, dB | Tolerance, dB |
|---|---|---|
| 31.5Hz | -38 | ±1.5 |
| 63 | -31.6 | ±1.5 |
| 100 | -26.1 | ±1.5 |
| 200 | -17.3 | ±1.5 |
| 400 | - 8.8 | ±1.5 |
| 800 | - 1.9 | ±1.5 |
| 1kHz | 0 | ±0.5 |
| 2 | + 5.3 | ±1.5 |
| 4 | + 8.2 | ±1.5 |
| 5 | + 8.4 | ±0.5 |
| 6.3 | + 8.0 | ±1.5 |
| 8 | + 5.1 | ±2.0 |
| 10 | + 9.7 | +3, -2 |

(3) JIS C1502A, JIS C5551A, NAB, IHF-A-202, and IEC-179-A Standard Noise Measurement Filter Characteristics

Table 4-8

| Frequency | Response, dB | Tolerance, dB |
|---|---|---|
| 31.5Hz | -39.2 | ±2 |
| 63 | -26.1 | ±2 |
| 125 | -16.1 | ±1 |
| 250 | - 8.6 | ±1 |
| 500 | - 3.2 | ±1 |
| 1kHz | 0 | 0 |
| 2 | + 1.2 | ±1 |
| 3.15 | + 1.2 | ±1 |
| 5 | + 0.5 | ±1 |
| 6.3 | - 0.1 | ±1 |
| 10 | - 2.4 | ±1 |
| 12.5 | - 4.2 | ±2 |
| 16 | - 6.5 | ±2 |

(4) CCIR (468-1, 468-2) and DIN 45405 (1978) Standard Noise Filter Characteristics

Table 4-9

Referenced to 0 dB at 1 kHz

| Frequency | Response, dB | Tolerance, dB |
|---|---|---|
| 31.5Hz | -29.9 | ±2 |
| 63 | -23.9 | ±1.4 |
| 100 | -19.8 | ±1 |
| 200 | -13.8 | ±0.85 |
| 400 | - 7.8 | ±0.7 |
| 800 | - 1.9 | ±0.55 |
| 1kHz | 0 | ±0.5 |
| 2 | + 5.6 | ±0.5 |
| 3.15 | + 9 | ±0.5 |
| 4 | +10.5 | ±0.5 |
| 5 | +11.7 | ±0.5 |
| 6.3 | +12.2 | 0 |
| 7.1 | +12 | ±0.2 |
| 8 | +11.4 | ±0.4 |
| 9 | +10.1 | ±0.6 |
| 10 | + 8.1, | ±0.8 |
| 12.5 | 0 | ±1.2 |
| 14 | - 5.3 | ±1.4 |
| 16 | -11.7 | ±1.65 |
| 20 | -22.2 | ±2.0 |
| 31.5 | -42.7 | +2.8, -∞ |

(5) CCIR/ARM Standard Noise Filter Characteristics

Table 4-10

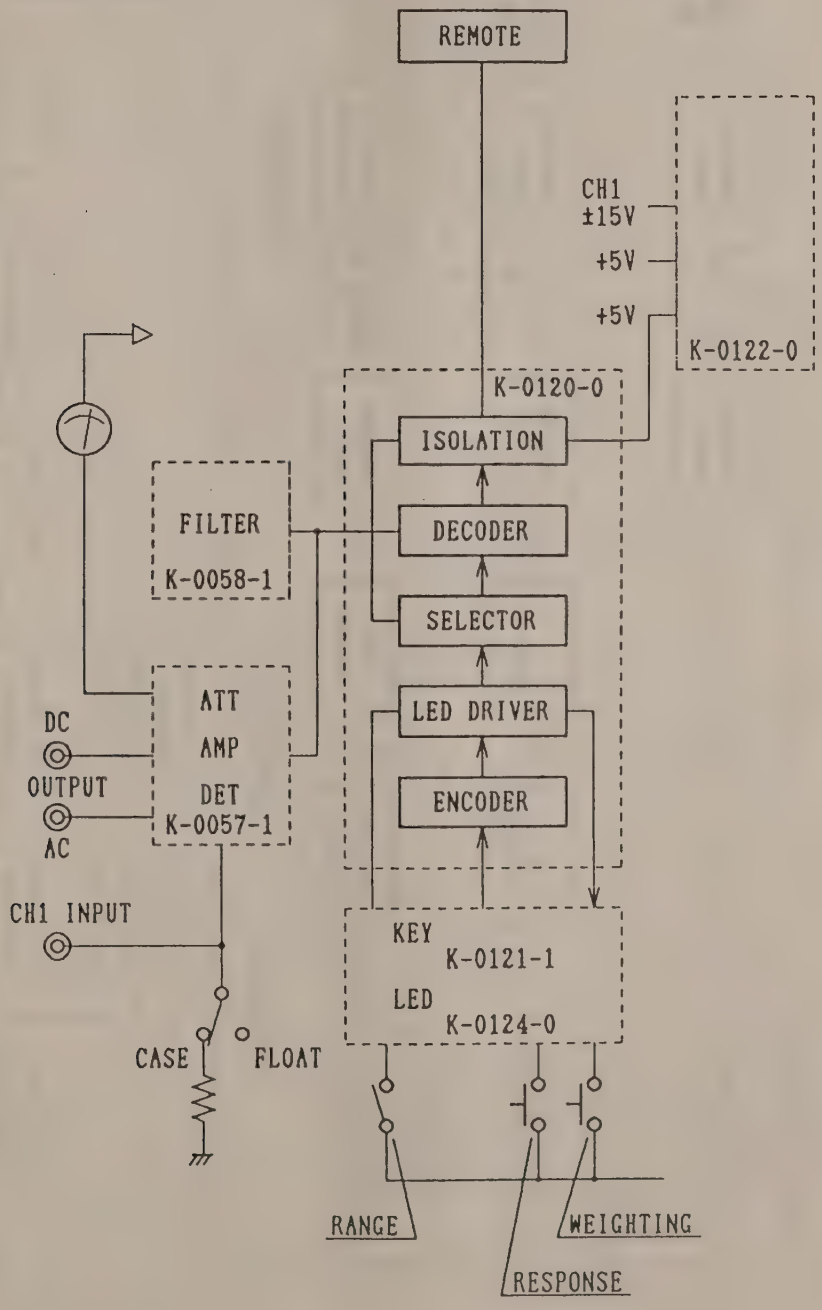
Referenced to 0 dB at 2 kHz

| Frequency | Response, dB | Tolerance, dB |
|---|---|---|
| 31.5Hz | -35.5 | ±2 |
| 63 | -29.5 | ±1.4 |
| 100 | -25.4 | ±1 |
| 200 | -19.4 | ±0.85 |
| 400 | -13.4 | ±0.7 |
| 800 | - 7.5 | ±0.55 |
| 1kHz | - 5.6 | ±0.5 |
| 2 | 0 | ±0.5 |
| 3.15 | + 3.4 | ±0.5 |
| 4 | + 4.9 | ±0.5 |
| 5 | + 6.1 | ±0.5 |
| 6.3 | + 6.6 | 0 |
| 7.1 | + 6.4 | ±0.2 |
| 8 | + 5.8 | ±0.4 |
| 9 | + 4.5 | ±0.6 |
| 10 | + 2.5 | ±0.8 |
| 12.5 | - 5.6 | ±1.2 |
| 14 | -10.9 | ±1.4 |
| 16 | -17.3 | ±1.65 |
| 20 | -27.8 | ±2.0 |
| 31.5 | -48.3 | +2.8, -∞ |

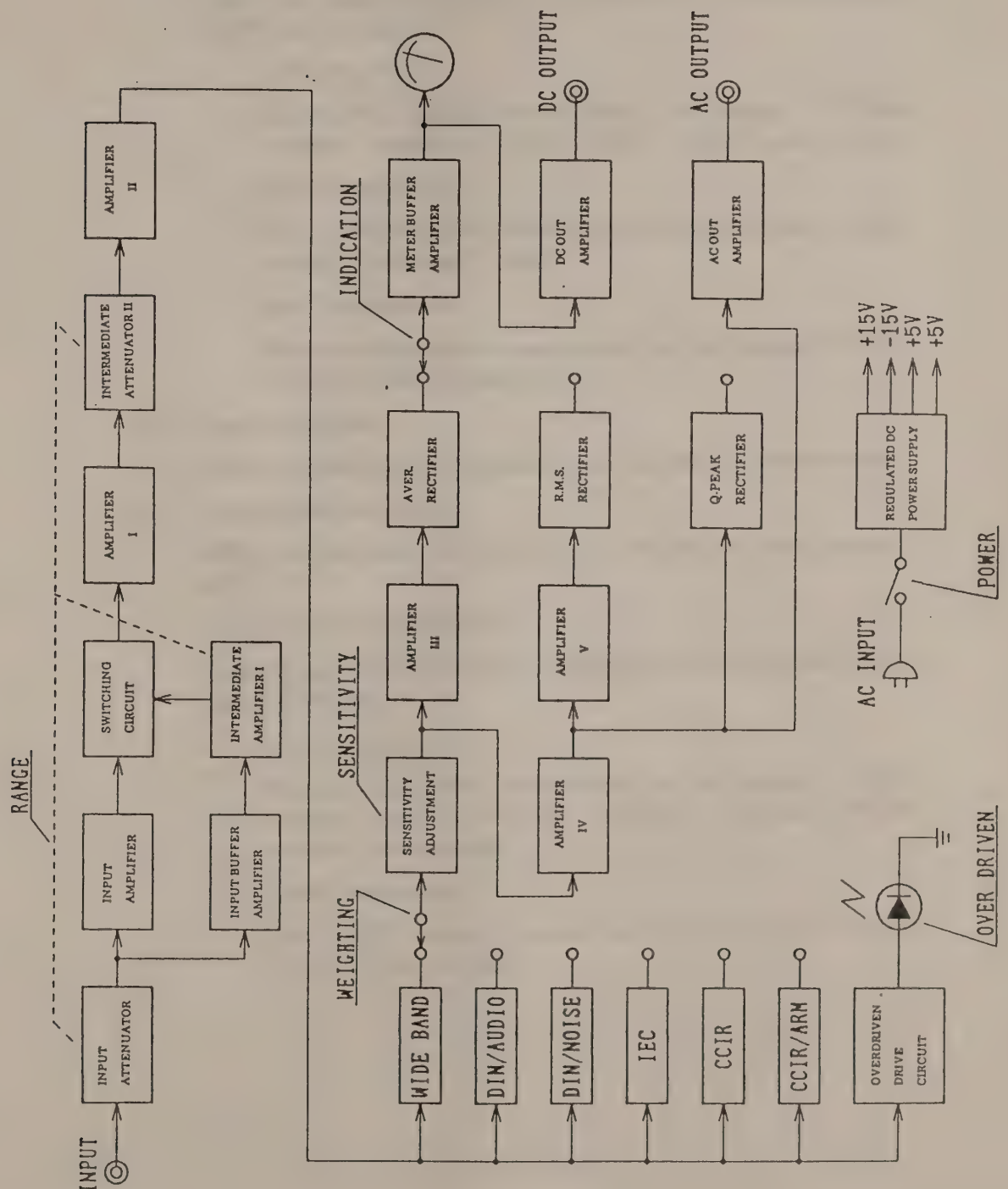
# 5. CIRCUIT DESCRIPTIONS

## 5.1 Block Diagram

### 5.1.1 System Diagram



## 5.1.2 Measurement System Block Diagram



## 5.2 Circuit Descriptions

(1) Input Attenuator

The 0-, 40-, and 80-dB resistive attenuators are operated by the RANGE switch ⑤.

a. 0 dB attenuator

The RANGE switch inserts this in the ranges −100 dB, −90 dB, −80 dB, −70 dB, −60 dB, −50 dB, and −30 dB.

b. 40-dB attenuator

The RANGE switch inserts this in the ranges −20 dB, −10 dB, 0 dB, and +10 dB.

c. 80-dB attenuator

The RANGE switch inserts this in the ranges +20 dB, +30 dB, +40 dB, and +50 dB.

(2) Input Amplifier

FET-input amplifier with high input impedance and low noise.

(3) Input Buffer Amplifier

FET-input amplifier with high input impedance and a gain of 0 dB.

(4) Intermediate Attenuators I

These 0- and 10-dB resistive attenuators are controlled by the RANGE switch ⑤.

a. 0 dB attenuator

The RANGE switch inserts this in the ranges −60 dB, −50 dB, −40 dB, −20 dB, −10 dB, 0 dB, and +20 dB, +30 dB, and +40 dB.

b. 10-dB attenuator

The RANGE switch inserts this in the ranges −30 dB, +10 dB, and +50 dB.

(5) Amplifier Switching Circuit

This circuit switches the amplifier I input between the input amplifier and the intermediate amplifier, according to the measurement input level.

(6) Amplifier I

This FET amplifier has low-noise and a gain of about 15 dB.

(7) Intermediate Attenuators II

These 0-, 10-, 20-, and 30-dB resistance attenuators are controlled by the RANGE switch ⑤.

a. 0-dB attenuator

The RANGE switch inserts this in the range −100 dB.

b. 10-dB attenuator

The RANGE switch inserts this in the ranges −90 dB, −60 dB, −20 dB, and +10 dB.

c. 20-dB attenuator

The RANGE switch inserts this in the ranges −80 dB, −50 dB, −10 dB, and +30 dB.

d. 30-dB attenuator

The RANGE switch inserts this in the ranges −70 dB, −40 dB, −30 dB, 0 dB, +10 dB, +40 dB, and +50 dB.

(8) Amplifier II

With three transistors, this amplifier has a gain of approximately 20 dB.

(9) Audio-Compensation Filters

The WIDE BAND, DIN/AUDIO, DIN/NOISE, IEC, CCIR, and CCIR/ARM filter circuits are selected by the WEIGHTING switches ⑪ to select the MN-446 measurement function.

(10) OVERDRIVEN Drive Circuit

This consists of the transistors and diodes of the rectification circuit combined with the converter (operational amplifier). It is operated by excessive input, and lights the OVERDRIVEN LED.

(11) Sensitivity Adjustment

This is operated by SENSITIVITY knob ⑥ to continuously vary the input level for an attenuation of approximately 10 dB.

(12) Amplifier III

This operational amplifier has a gain of approximately 40 dB.

(13) Amplifiers IV and V

These operational amplifiers have gains of approximately 23 and 16 dB, respectively.

(14) Rectification Circuit

This circuit consists of an absolute-value rectification circuit, a resistor, and a capacitor. The RESPONSE switch ⑧ is used to select quasi-peak (Q-PEAK), average (AVER.), or rms (R.M.S.) detection.

(15) AC OUT Amplifier

This operational amplifier has a gain of approximately 10 dB.

(16) DC Amplifier

This operational amplifier has a gain of approximately 12 dB.

(17) Power Supply Circuit

IC regulation provides a stable power supply with a fixed voltage of ±15 V and two +5-V outputs.

# 6. MAINTENANCE

## 6.1 Periodic Inspection and Recalibration

The MN-446 must be kept in good working order at all times to ensure correct measurement. To this end, periodic inspection must be conducted at least once every six months, and recalibration performed if necessary.

## 6.2 Visual Checks

The following visual checks in the MN-446 should be performed during recalibration to prevent faults from occurring.

a. Looseness in the pushbutton and other switches, and dirt on the terminals.

b. Looseness and dirt in the connectors.

c. Looseness in the screws, etc., holding mounted components.

d. Metal chips and loose screws.

e. Burnt-out resistors.

## 6.3 Operating Environment and Storage Location

- The MN-446 should be neither operated nor stored in environments with the following characteristics that can cause mechanical, chemical, or other damage.

  a. Locations receiving direct sunlight.

  b. Locations with high humidity.

  c. Locations where dust accumulates.

  d. Locations subject to much vibration.

  e. Locations subject to powerful electromagnetic fields.

- The MN-446 is designed for stable operation in the range 0 to 40°C (note that the range for guaranteed performance is 5 to 35°C), so it should not be used at lower than 0°C or placed on top of equipment generating excessive heat.

## 6.4 Fuse Replacement

When a fuse blows, turn the cap of the fuse holder on the rear panel in the direction of the arrow to remove it. The new fuse can now be inserted.

Note that the current rating of the fuse used should agree with the specifications given in Table 6-1 for the respective line voltages.

If the new fuse blows soon after being inserted, this probably indicates a fault, which should be corrected with before inserting another fuse.

Table 6-1

| Ac Line Voltage | Supply Voltage Selector | Fuse |
|---|---|---|
| 90 to 110 V | A | 0.5 A |
| 104 to 126 V | B | |
| 194 to 236 V | C | 0.3 A |
| 207 to 253 V | D | |

## 6.5 Removing the Covers

Note

Be absolutely sure to remove the power cable from the ac line.

### 6.5.1 Removing the Upper Cover (See Fig. 6-1)

Remove the three screws on both sides of the MN-446 as well as the two on the top, holding down the panel frames and pull up the handle.

### 6.5.2 Removing the Lower Cover (See Fig. 6-1)

The lower cover is secured with four screws as shown in Fig. 6-1. The cover can be removed by removing these screws.

Removing The MN-446 Cover

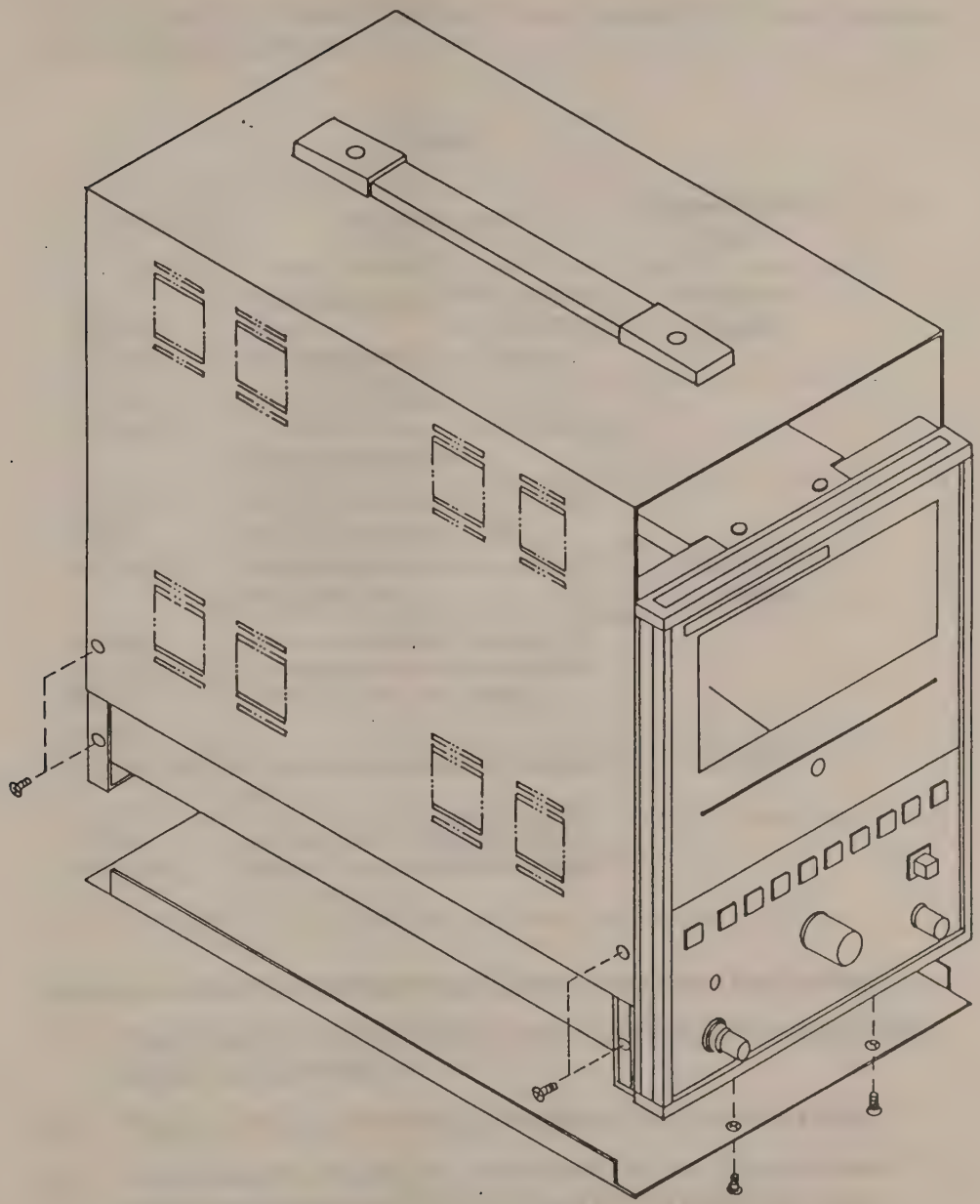


Fig. 6-1

## 6.6 Measuring Instruments Required for Periodic Inspection and Calibration

The instruments listed in Table 6-2 are required for inspecting and calibrating the MN-446.

Table 6-2

| Instrument | Specifications | Recommended Model |
|---|---|---|
| Low-frequency oscillator | Frequency range 5 Hz to 500 kHz<br>Output 600 Ω with load<br>Distortion factor 0.2 % max. | MCR-4031 (Meguro) |
| Electronic voltmeter | Measurement capability up to −100 dB (0 dB = 1 V) in 10 Hz to 1 MHz frequency range. | |
| Frequency counter | Measurement capability in 10 Hz to 1 MHz frequency range. | |
| Oscilloscope | 10 mV/cm sensitivity and dc to 10 MHz bandwidth | MO-1252A<br>MO-1254A |
| Resistive attenuator (600-Ω system) | Attenuation with an accuracy of 0.1 dB from 0 to −100 dB in 10 Hz to 500 kHz frequency range. | |
| Dc voltmeter | Measurement capability from 0 to 30 V | MD-30 |
| Voltage calibrator | Capable of providing calibration voltage in the range 0.01 mV to 300 V at 1 kHz. | |

## 6.7 Cautions when Performing Periodic Inspections and Calibration

(1) Check that the meter needles are mechanically zeroed before turning the power on.

(2) Check that the ac line voltage is within the specified range.

(3) These checks should be performed in an environment of ambient temperature 10 to 30°C and free of electrical noise.

(4) Allow ten minutes after the power is turned on for the instrument to warm up. Remember that the other measuring instruments used in inspection and calibration also have to be warmed up before being used.

(5) Read this instruction manual carefully and make sure everything is clearly understood before starting the inspection and calibration procedure.

(6) If the MN-446 cannot satisfy the specifications even after it has been calibrated, this indicates that there is a fault in the instrument. If so, contact your service representative.

## 6.8 Preparations for Inspection and Calibration

(1) Make the following settings for the switches and knobs before connecting the power cable to the specified ac line.

| | | |
|---|---|---|
| ① | POWER switch | OFF |
| ⑤ | RANGE switch | 300 V +50 dB |
| ⑥ | SENSITIVITY knob | CAL. |
| ⑧ | RESPONSE switch | Q-PEAK |
| ⑪ | WEIGHTING switch | WIDE BAND |

(2) Connect the power cable to an ac line of the proper voltage.

(3) Turn the POWER switch on, and allow ten minutes warm-up time.

## 6.9 Supply Voltage Check

Connect a digital voltmeter between TP1, TP2 and the ground and check that it is ±15 V (14.4 to 15.6 V).

This circuit is an IC voltage regulator and the output voltage is kept constant. If the output voltage varies widely, this is due to a fault in the IC.

## 6.10 Meter Sensitivity and AC and DC Output Level Adjustments

(1) Connect the low-frequency oscillator, frequency counter, resistance attenuators, and the wideband electronic voltmeter to the MN-446 as shown in Fig. 6-2.

(2) Set the low-frequency oscillator frequency to 1 kHz and output to 1 Vrms.

(3) Set the attenuation of the resistive attenuators to 0 dB.

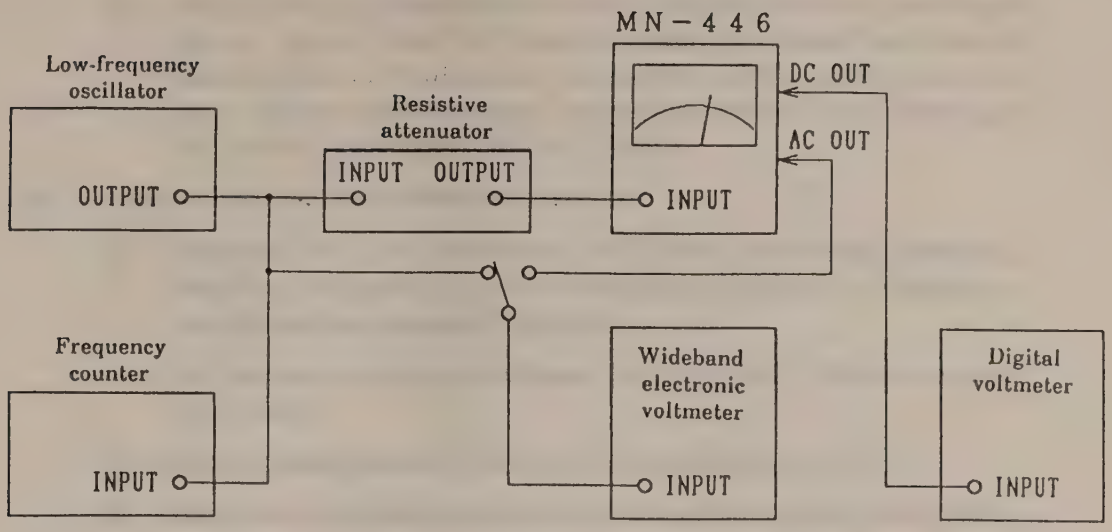



Fig. 6-2

(4) Make the following settings for the switches and knobs before connecting the power cable to the specified ac line.

| | | |
|---|---|---|
| ⑤ | RANGE switch | 1V, 0 dB |
| ⑥ | SENSITIVITY knob | CAL. |
| ⑧ | RESPONSE switch | Q-PEAK |
| ⑪ | WEIGHTING switch | WIDE BAND |

(5) Check that the meter indicates 1 Vrms, and if not adjust it to that value with R183 Q-PEAK ADJ.

(6) Select the AVER. RESPONSE switch. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R183 Q-PEAK ADJ.

(7) Select the R.M.S. RESPONSE switch. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R183 Q-PEAK ADJ.

(8) Now set the attenuation of the resistance attenuators to −70 dB and make the following switch settings.

| | | |
|---|---|---|
| ⑤ | RANGE switch | 0.3V, −70 dB |
| ⑧ | RESPONSE switch | Q-PEAK |

At this point, check that the meter indicates −70 dBV, and if not adjust it to that value with R31 GAIN ADJ.

(9) Make the switch settings given in (4) above again and check the ac output level (1 Vrms at meter full scale) and the dc output level (1 V at meter full scale). If the meter does not show the specified reading, adjust it to them using R147 (AC OUT ADJ.) and R190 (DC OUT ADJ.).

## 6.11 Audio-Compensation Filter Adjustment

(1) Connect the low-frequency oscillator, frequency counter, resistive attenuators, and the wideband electronic voltmeter to the MN-446 as shown in Fig. 6-2.

(2) Set the low-frequency oscillator frequency to 1 kHz and output to 1 Vrms.

(3) Set the attenuation of the resistive attenuators to 0 dB.

(4) Make the following settings for the switches and knobs before connecting the power cable to the specified ac line.

| | | |
|---|---|---|
| ⑤ | RANGE switch | 1V, 0 dBμ |
| ⑥ | SENSITIVITY knob | CAL. |
| ⑧ | RESPONSE switch | AVER. |
| ⑪ | WEIGHTING switch | WIDE BAND |

(5) Check that the meter indicates 1 Vrms.

(6) Select the DIN/AUDIO WEIGHTING switch. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R12 (AUDIO ADJ.).

(7) Select the DIN/NOISE WEIGHTING switch. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R25 (NOISE ADJ.).

(8) Select the IEC WEIGHTING switch. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R35 (JIS ADJ.).

(9) Select the CCIR WEIGHTING switch. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R45 (CCIR ADJ.).

(10) Select the CCIR/ARM WEIGHTING switch, and set the low-frequency oscillator to 2 kHz. At this point, check that the meter indicates 1 Vrms, and if not adjust it to that value with R48 (ARM ADJ.).

## 6.12 Adjustment Locations

1) PCB K-0057-1

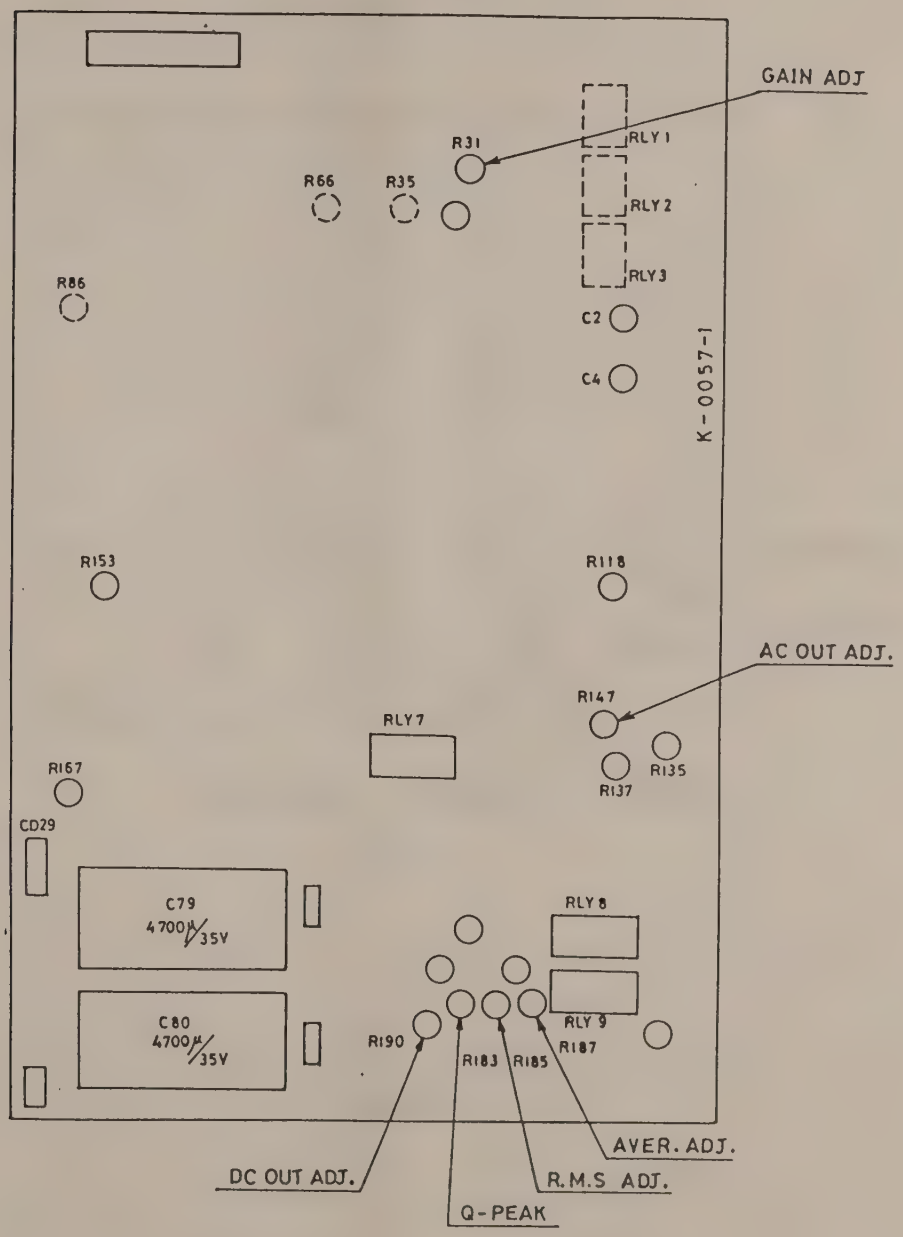



Fig. 6-3

2) PCB K-0058-1 (Audio-Compensation Filters)

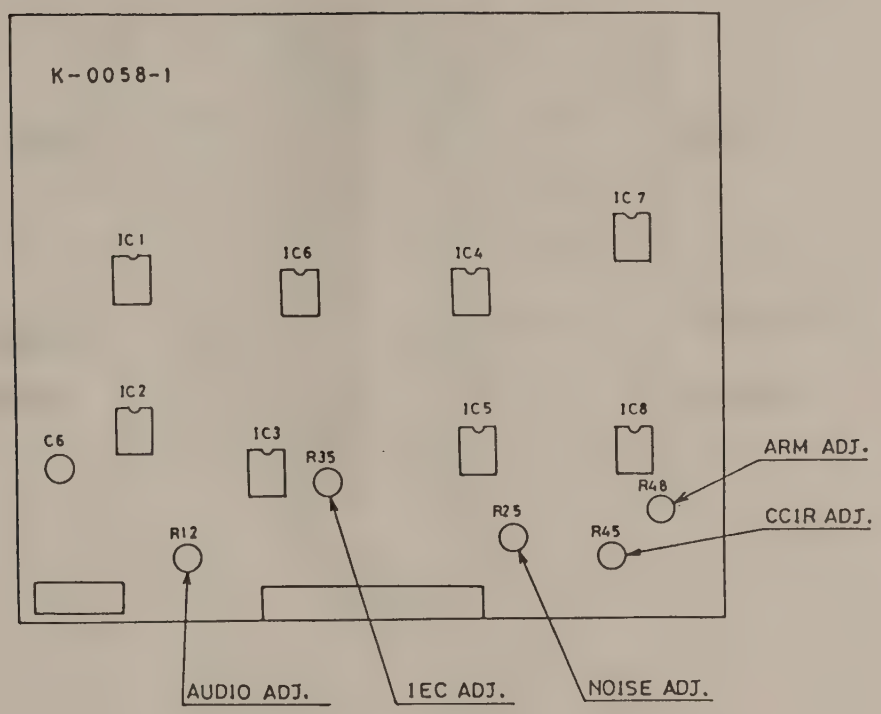



Fig. 6-4

## 7. REMOTE CONTROL

### 7.1 Connector Arrangement

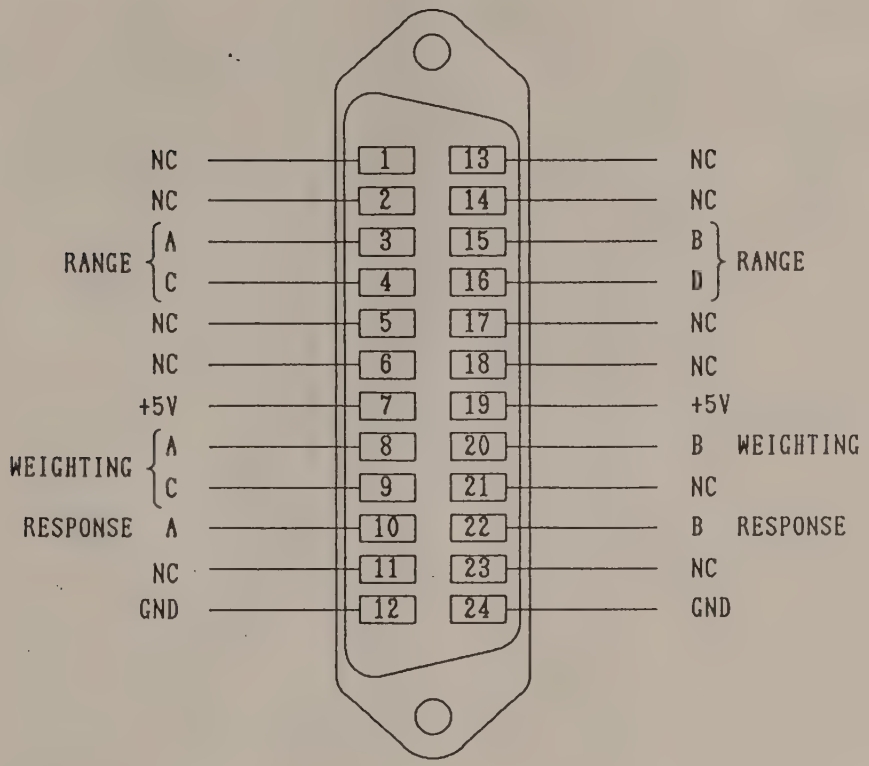
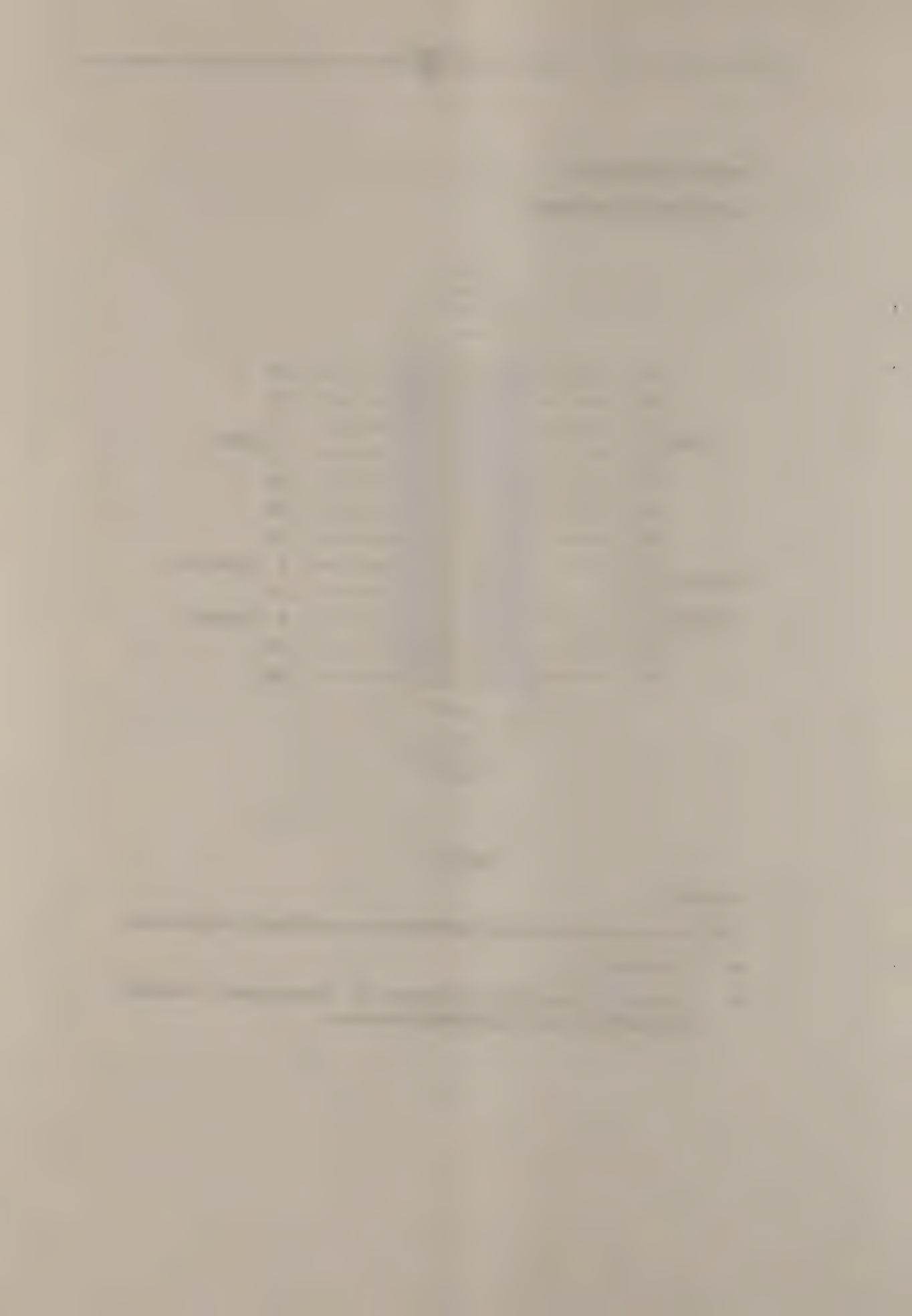



Fig. 7-1

### 7.2 General

The following remote control functions are available in the MN-446.

- Listen only.
- Power-on reset for operation of front-panel RANGE, WEIGHTING and RESPONSE switches.



# MN-446 LOGIC TABLE

RANGE

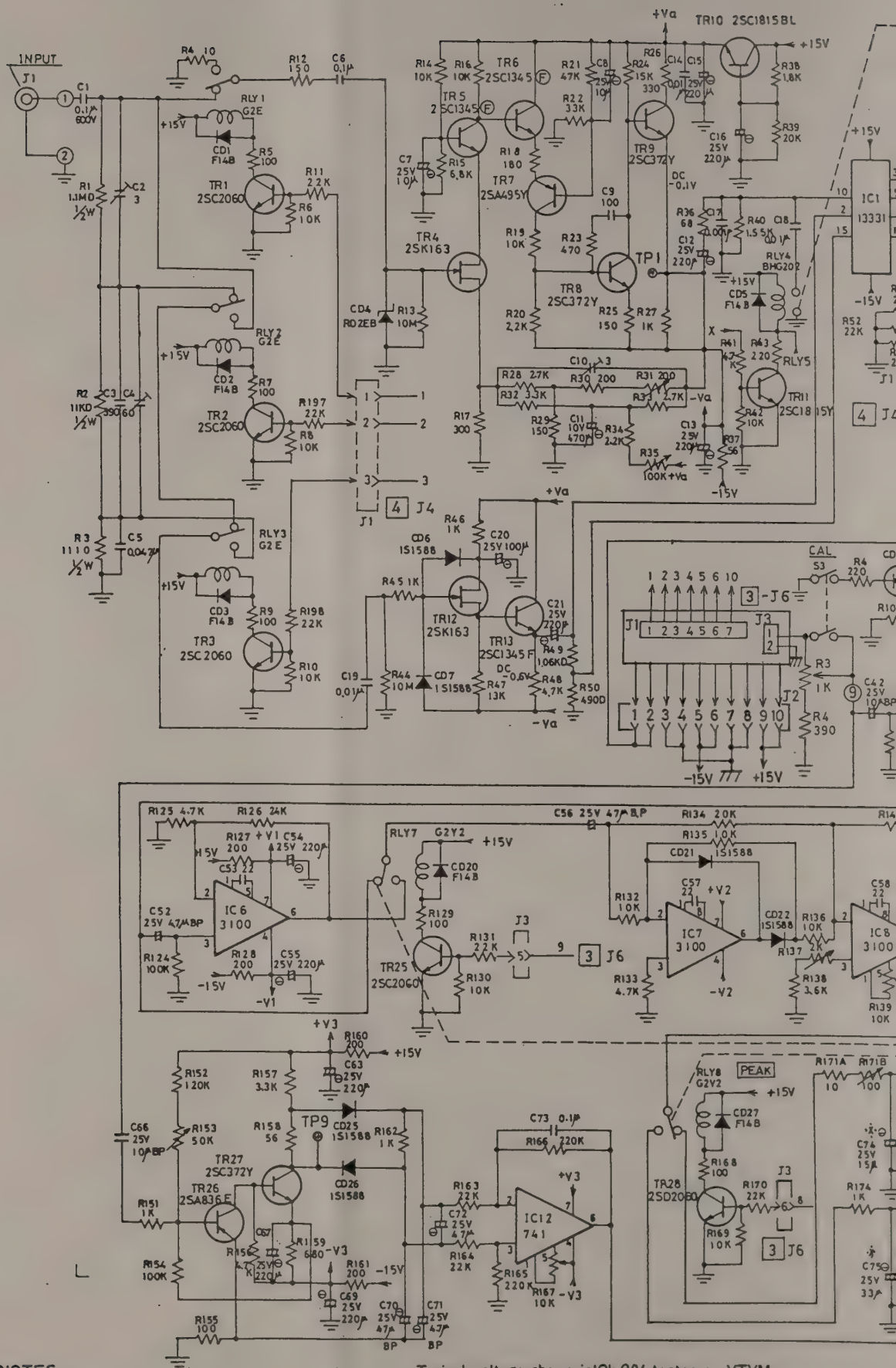
| | A | B | C | D |
|---|---|---|---|---|
| 300V | 0 | 0 | 0 | 0 |
| 100V | 1 | 0 | 0 | 0 |
| 30V | 0 | 1 | 0 | 0 |
| 10V | 1 | 1 | 0 | 0 |
| 3V | 0 | 0 | 1 | 0 |
| 1V | 1 | 0 | 1 | 0 |
| 300mV | 0 | 1 | 1 | 0 |
| 100mV | 1 | 1 | 1 | 0 |
| 30mV | 0 | 0 | 0 | 1 |
| 10mV | 1 | 0 | 0 | 1 |
| 3mV | 0 | 1 | 0 | 1 |
| 1mV | 1 | 1 | 0 | 1 |
| 0.3mV | 0 | 0 | 1 | 1 |
| 0.1mV | 1 | 0 | 1 | 1 |
| 0.03mV | 0 | 1 | 1 | 1 |
| 0.01mV | 1 | 1 | 1 | 1 |

WEIGHTING

| | A | B | C |
|---|---|---|---|
| WIDE | 0 | 0 | 0 |
| AUDIO | 1 | 0 | 0 |
| NOISE | 0 | 1 | 0 |
| JIS A | 1 | 1 | 0 |
| CCIR | 0 | 0 | 1 |
| CCIR/ARM | 1 | 0 | 1 |

RESPONSE

| | A | B |
|---|---|---|
| AVER | 0 | 0 |
| PEAK | 1 | 0 |
| RMS | 0 | 1 |




NOTES

Unless otherwise indicated:

Resistance in Ω, k=kΩ, M=MΩ

Resistors 1/4 watt

Capacitance in pF μ=μF

NAME Screwdriver adjustment in case

NAME Screwdriver adjustment on panel

NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM

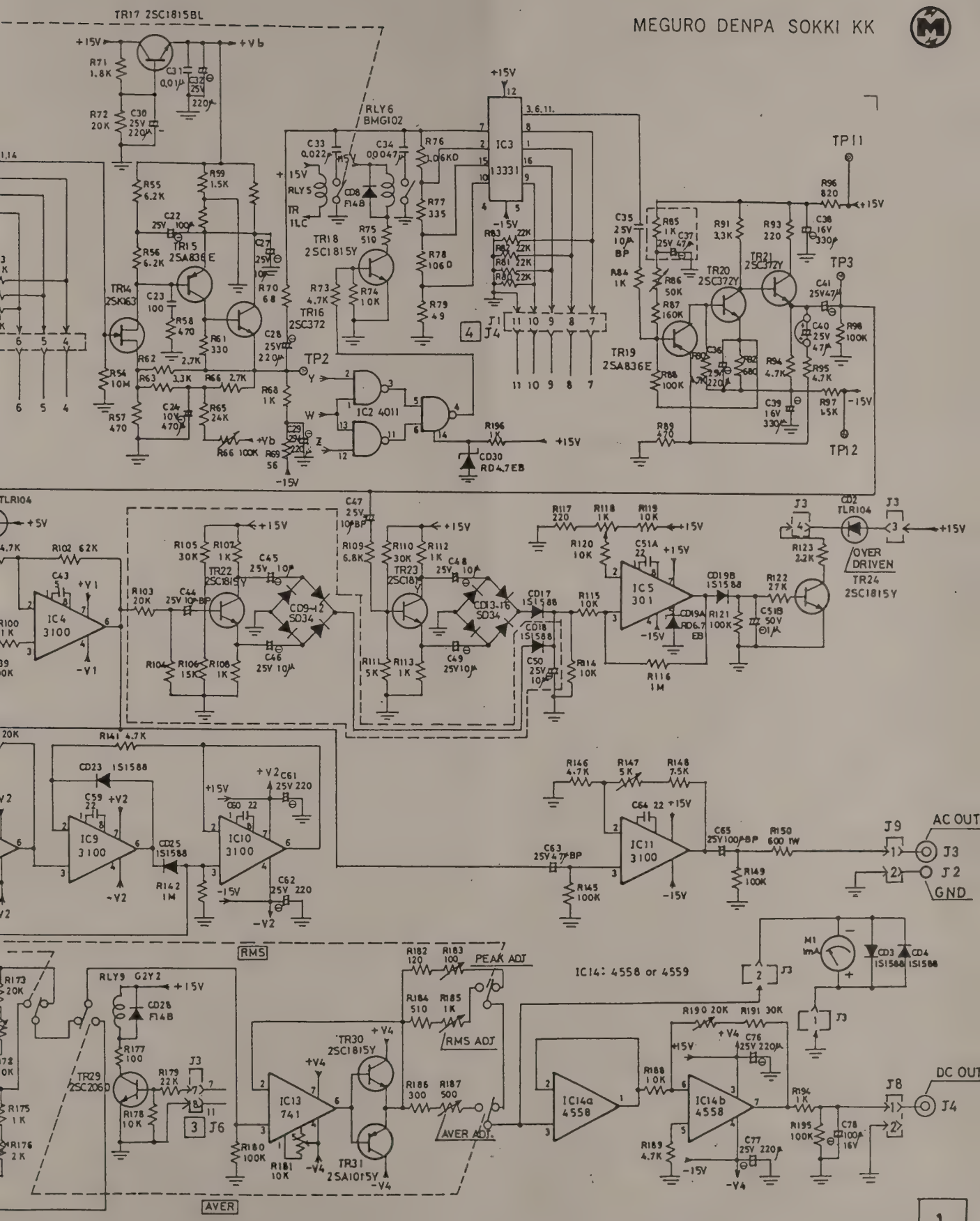
Rotary switch section shown in max CCW position

※ Value selected at factory; Average value shown

PCB Printed Circuit Board

② Connector or Terminal number

MEGURO DENPA SOKKI KK




SCHEMATIC DIAGRAM MN-446

NOISE METER

K-0057-0

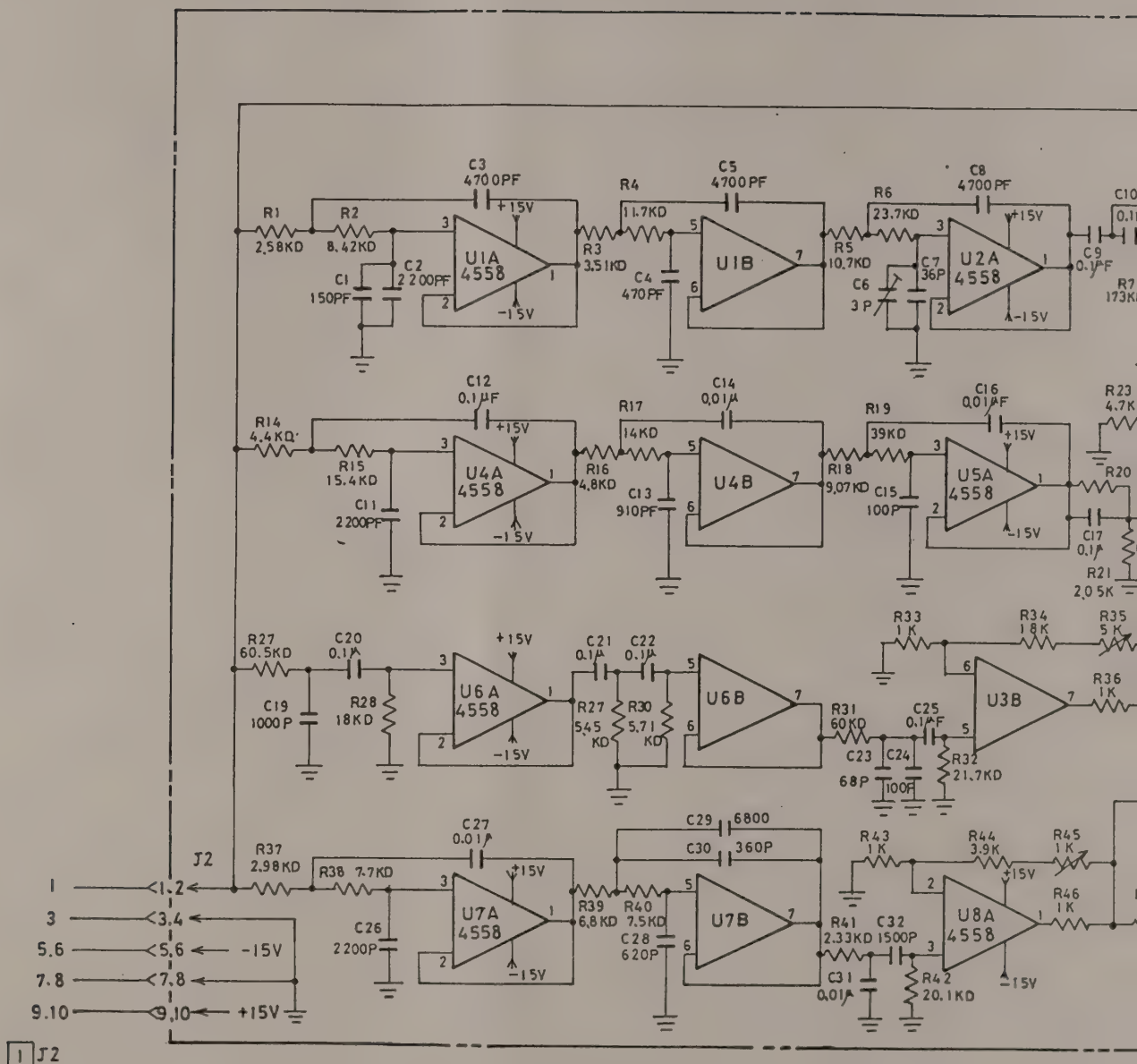
CHANGES: 1990.7

DRAWING: MATHUMOTO

CHECK:

DATE: 1987.7

1




NOTES

Unless otherwise indicated:

Resistance in Ω, k=kΩ, M=MΩ

Resistors 1/4 watt

Capacistance in pF μ=μF

NAME Screwdriver adjustment in case

NAME Screwdriver adjustment on panel

NAME Knob control and Panel markings

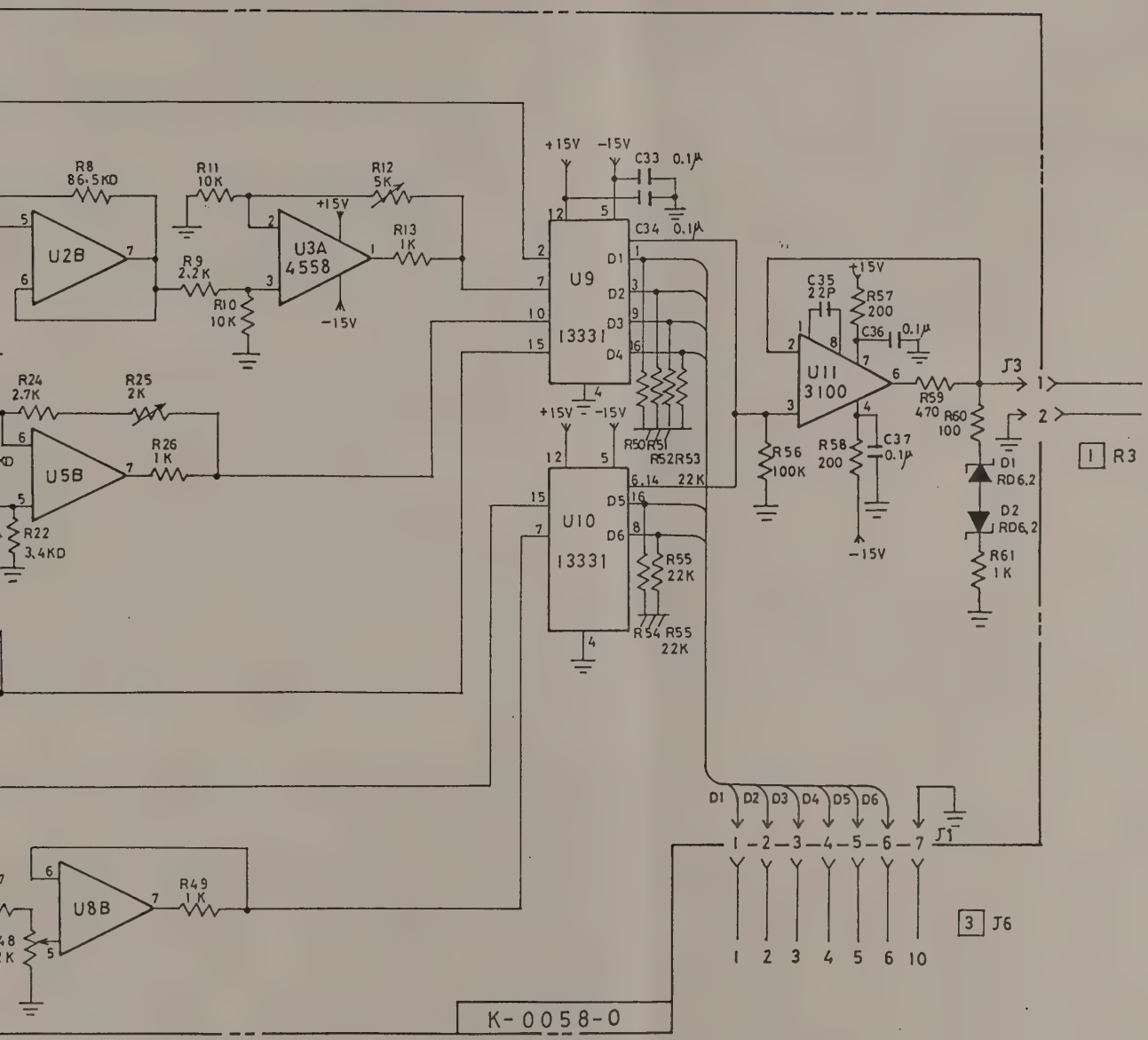
Typical voltage shown in10kΩ/V tester or VTVM

Rotary switch section shown in max CCW position

※ Value selected at factory; Average value shown

PCB Printed Circuit Board

② Connector or Terminal number




SCHEMATIC DIAGRAM MN-446

NOISE METER

K-0058-0

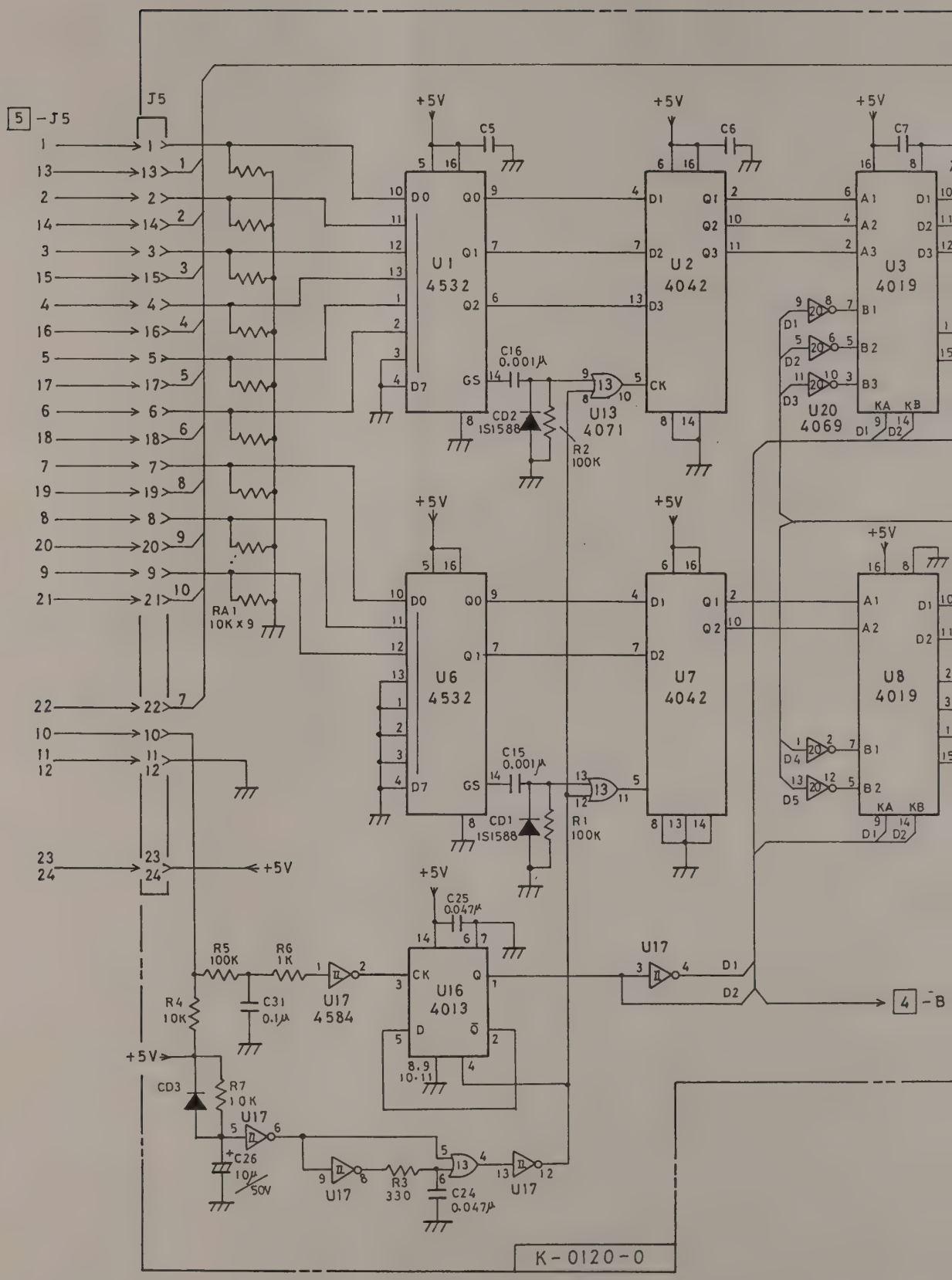
2

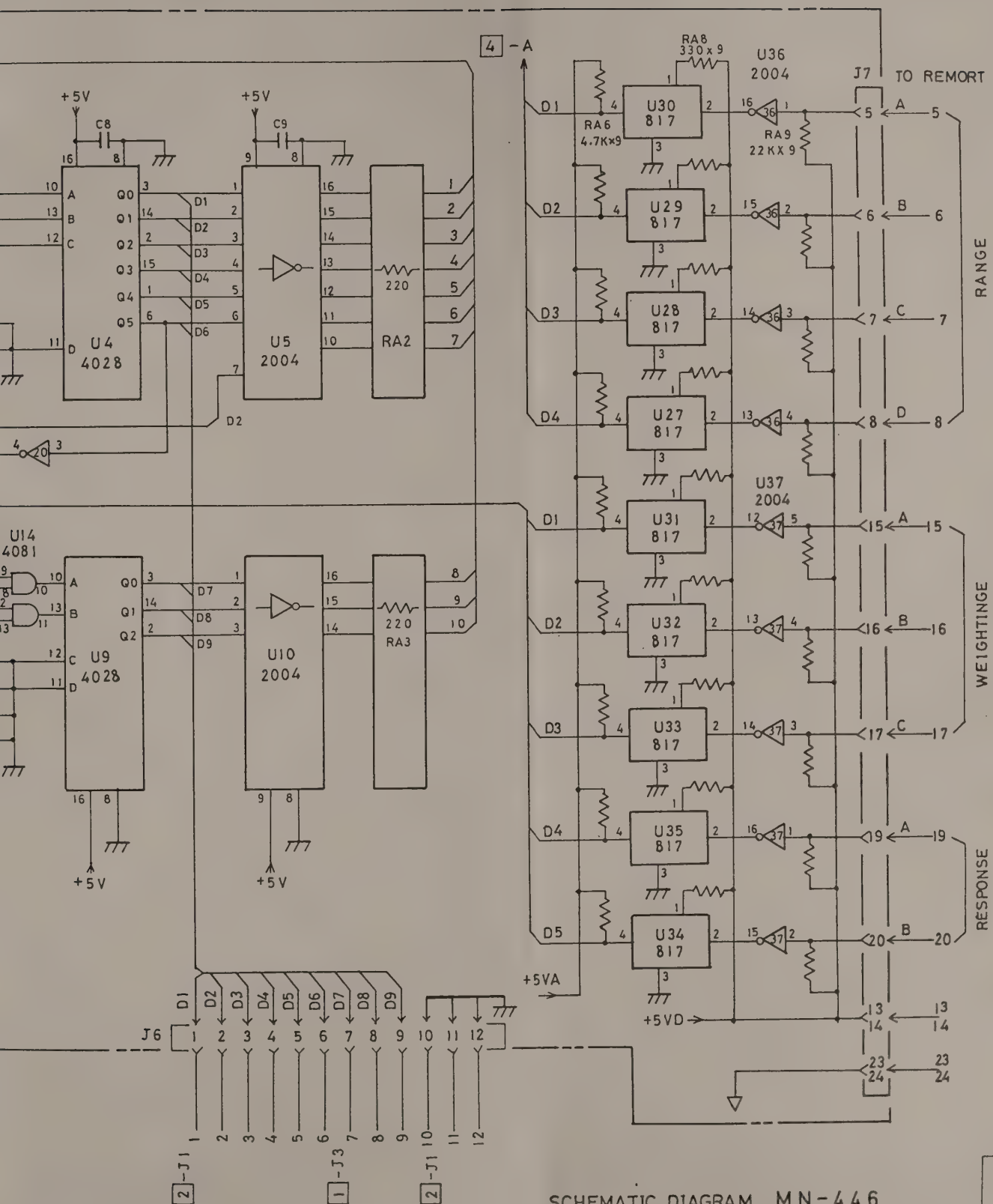
CHANGES:

DRAWING: MATHUMOTO

CHECK:

DATE: 1987.7


5 -J5
J5
+5V
C5
C6
C7
U1
4532
U2
4042
U3
4019
U20
4069
C16
0.001μ
CD2
1S1588
R2
100K
U13
4071
RA1
10K x 9
U6
4532
U7
4042
U8
4019
C15
0.001μ
CD1
1S1588
R1
100K
C25
0.047μ
U16
4013
U17
4584
R5
100K
R6
1K
C31
0.1μ
R4
10K
CD3
R7
10K
C26
10μ
50V
R3
330
C24
0.047μ
4 -B
K-0120-0




SCHEMATIC DIAGRAM MN-446

NOISE METER

K-0120-0

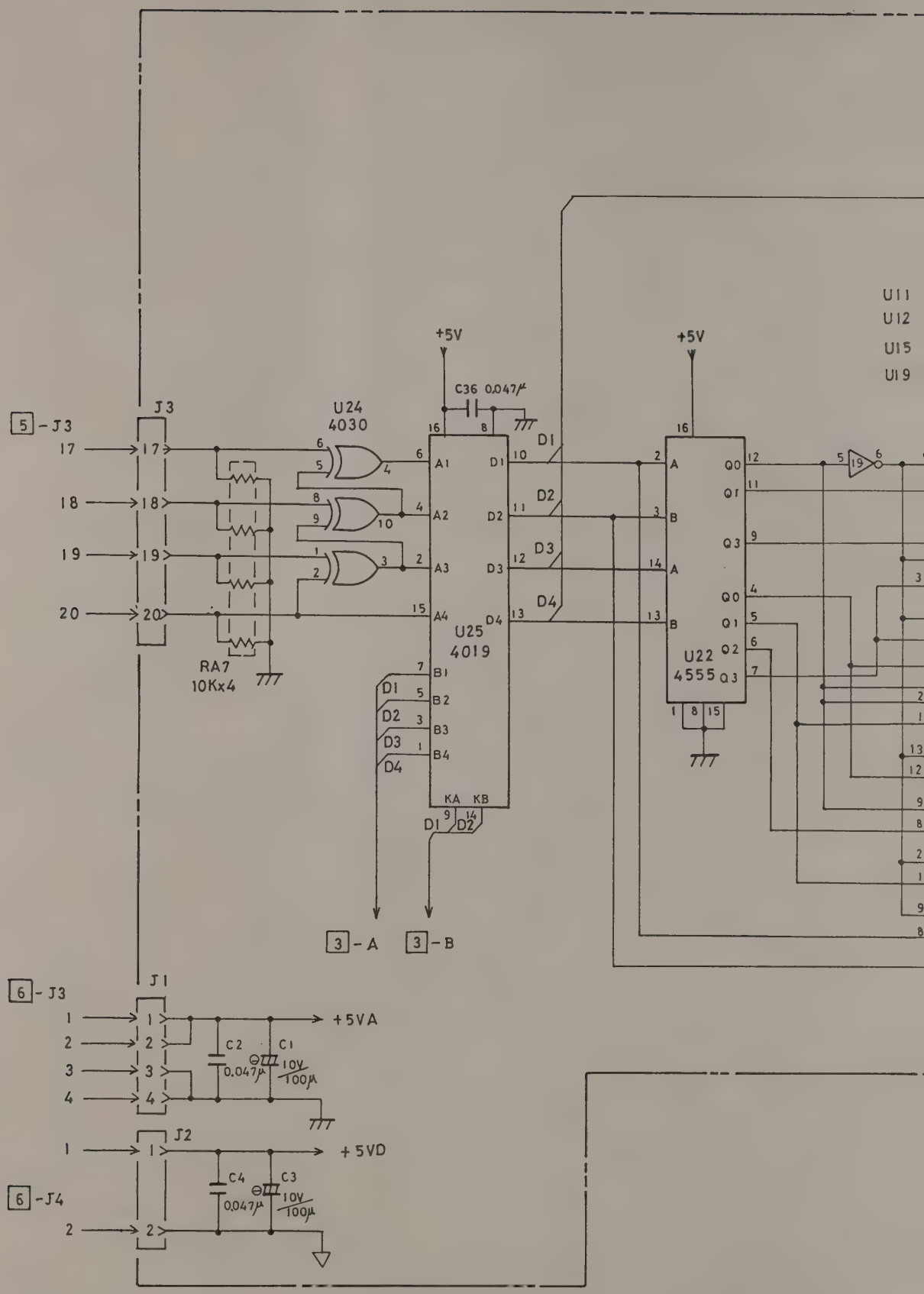
3

CHANGES:

DRAWING: MATHUMOTO

CHECK:

DATE: 1988.4




NOTES

Unless otherwise indicated:

Resistance in Ω, k=kΩ, M=MΩ

Resistors 1/4 watt

Capacitance in pF μ=μF

NAME Screwdriver adjustment in case

NAME Screwdriver adjustment on panel

NAME Knob control and Panel markings

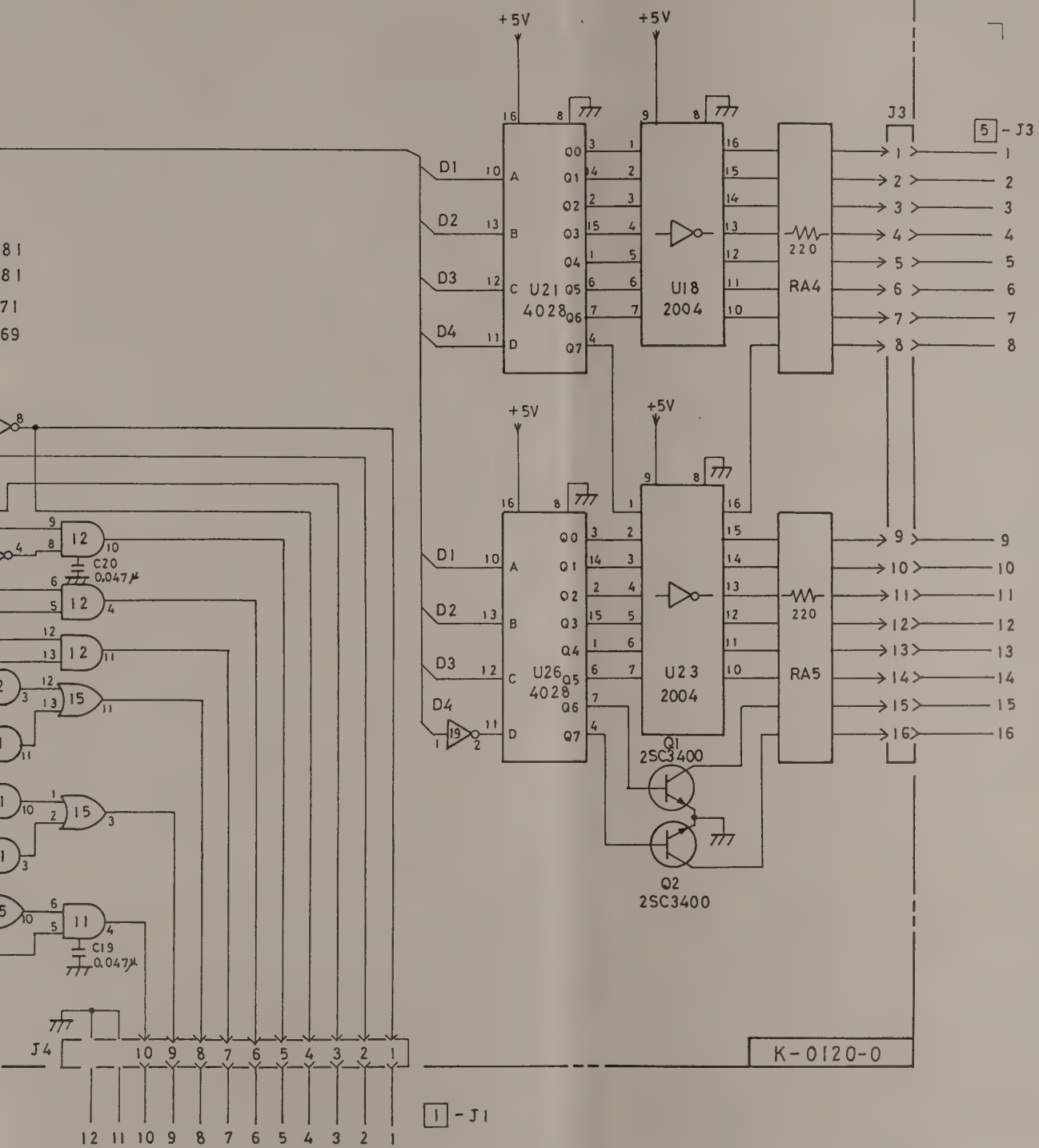
Typical voltage shown in 10kΩ/V tester or VTVM

Rotary switch section shown in max CCW position

※ Value selected at factory; Average value shown

PCB Printed Circuit Board

② Connector or Terminal number




SCHEMATIC DIAGRAM MN-446

NOISE METER

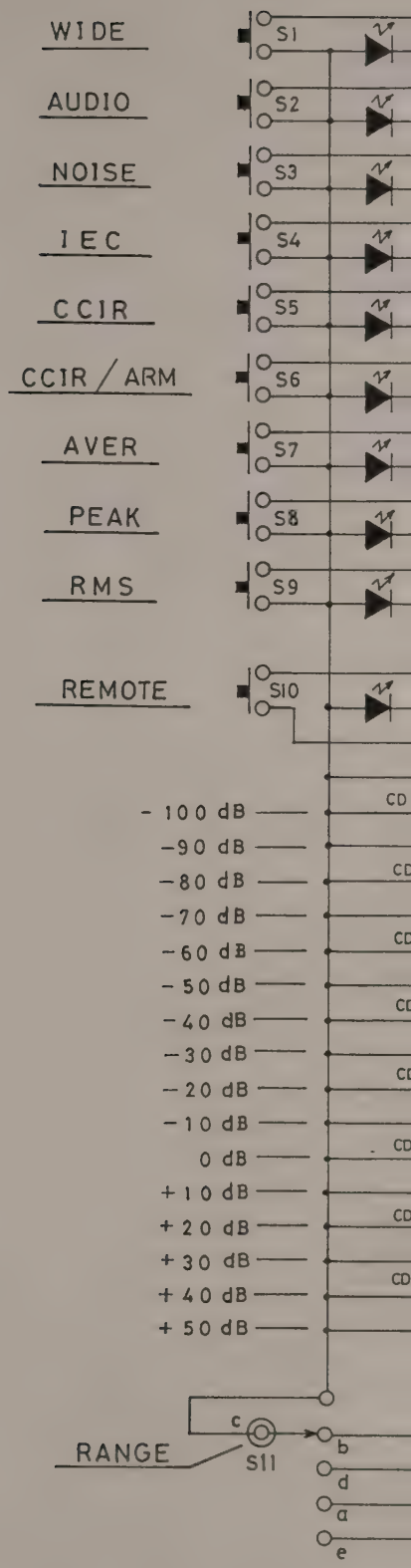
K-0120-0

CHANGES:

DRAWING: MATHUMOTO

CHECK:

DATE: 1988.4




NOTES

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Resistors 1/4watt

Capacistance in pF μ=μF

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NAME Screwdriver adjustment on panel

NAME Knob control and Panel markings

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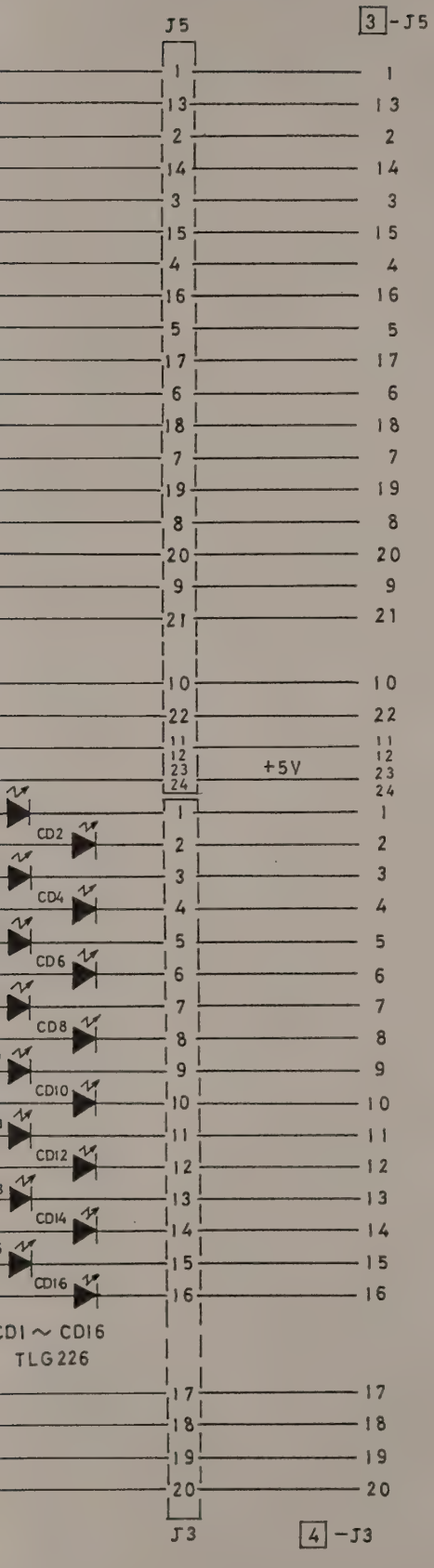
Rotary switch section shown in max CCW position

※ Value selected at factory; Average value shown

PCB Printed Circuit Board

② Connector or Terminal number




CHANGES:

DRAWING: MATHUMOTO

CHECK:

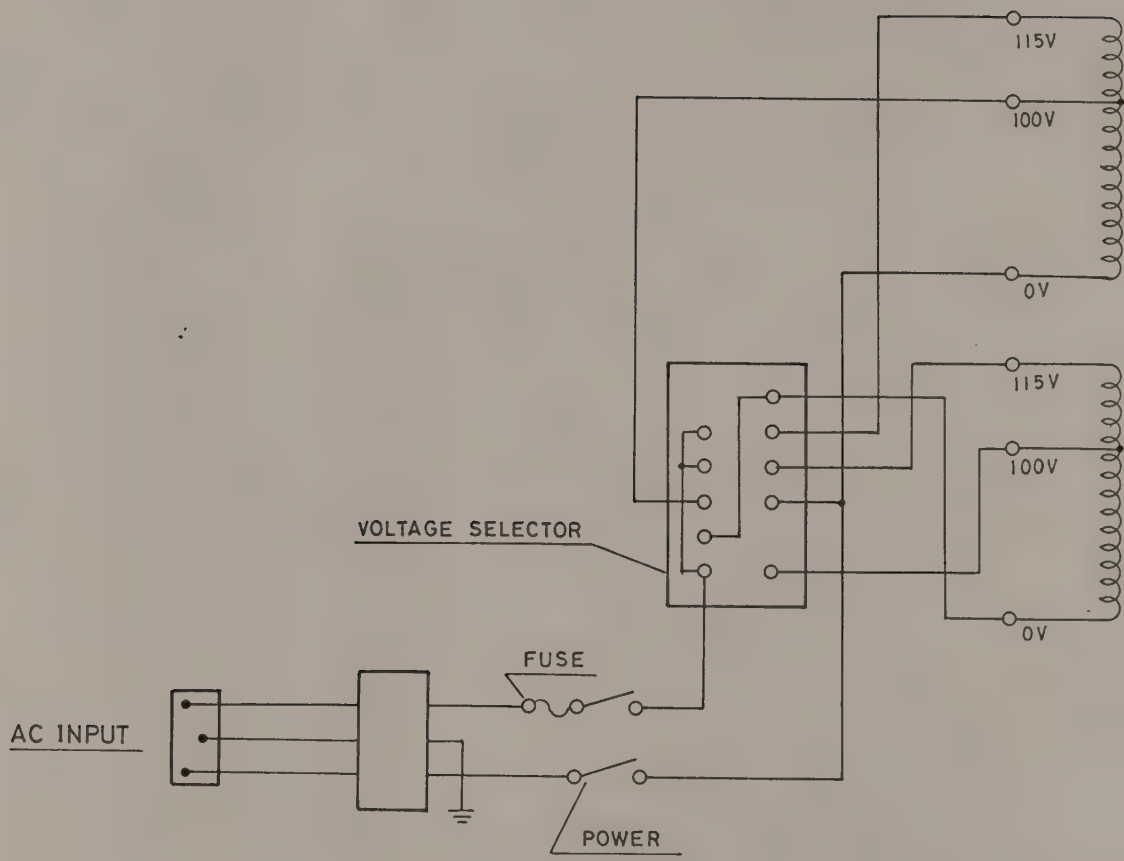
DATE: 1988. 4

SCHEMATIC DIAGRAM MN-446

NOISE METER

K-0121-1

5




NOTES

Unless otherwise indicated:

Resistance in Ω, k=kΩ, M=MΩ

Resistors 1/4watt

Capacistance in pF μ=μF

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NAME Screwdriver adjustment on panel

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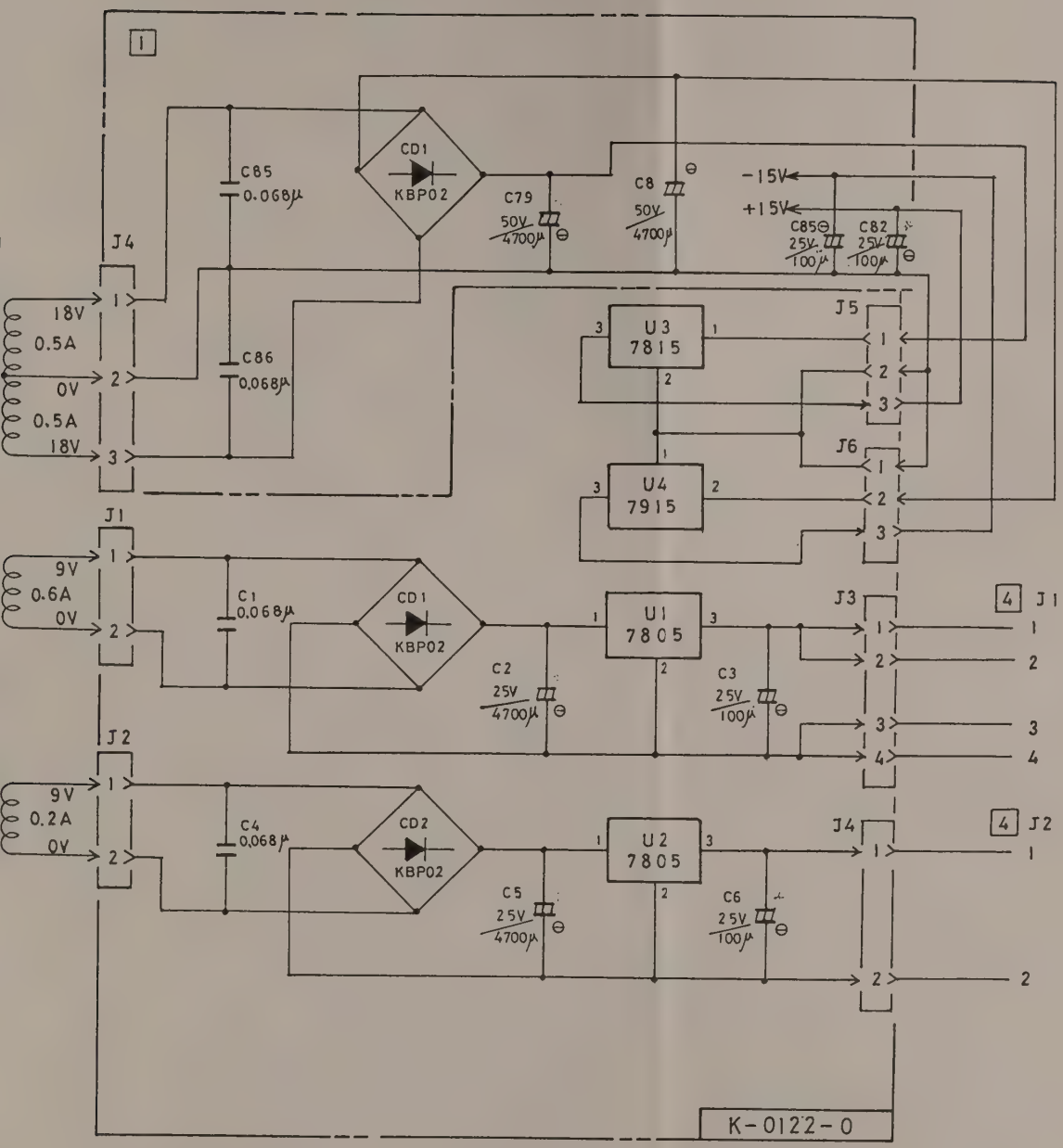
※ Value selected at factory; Average value shown

PCB Printed Circuit Board

② Connector or Terminal number

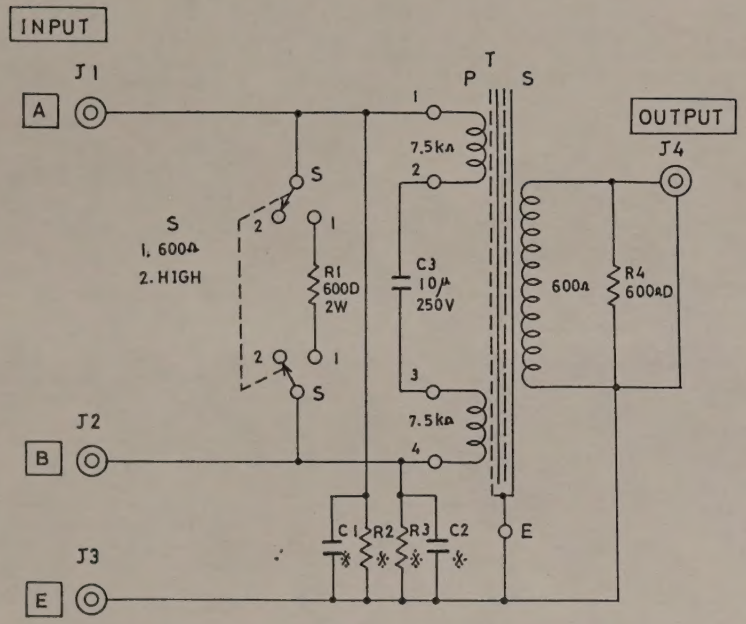



SCHEMATIC DIAGRAM MN-446

NOISE METER
K-0122-0
POWER SUPPLY

CHANGES:
DRAWING: MATHUMOTO
CHECK:
DATE: 1988.4

# MN-446 NOISE METER OPTION

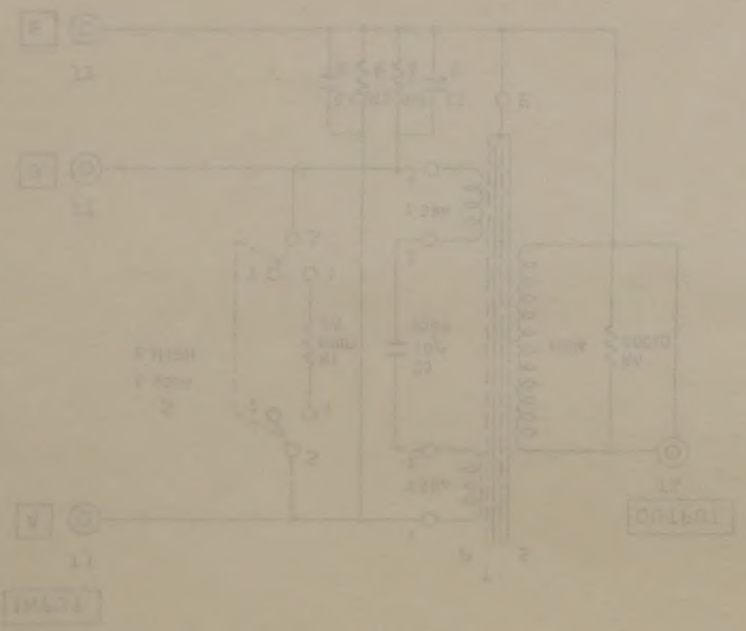


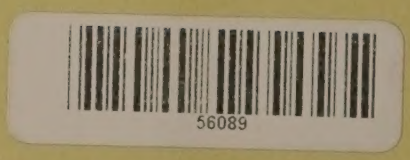

## INPUT TRANSFORMER SPECIFICATION

| | |
|---|---|
| INPUT LEVEL | +34 dBm |
| FREQ. RESPONSE | 20Hz ~ 20kHz ± 0.2dB MAX. |
| IMPEDANCE | P: 7.5kΩ×2, S: 600Ω ±1% MAX. |
| LOSS | 0.1dB MAX. |

CHANGES:
DRAWING: KUBOTA
CHECK:
DATE: 1988.10

SCHEMATIC DIAGRAM MN-446
NOISE METER






**MEGURO ELECTRONICS CORPORATION**

No. 5, 1, 2-chome, Chuo-cho, Meguro-ku, Tokyo, Japan
Tel.: Tokyo (3715) 1211 Cables: MEGURO DENPA TOKYO